

U.S. MARINE CORPS TECHNICAL MANUAL

**OPERATOR/CREW MAINTENANCE MANUAL
WITH COMPONENTS LIST AND REPAIR PARTS LIST**

FOR

**SHELTER EXPANDABLE
(MOBILE TACTICAL SHELTER)**

AN/TSQ-272

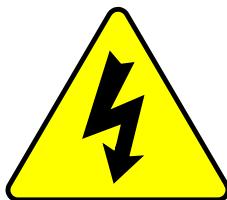
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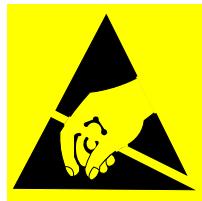
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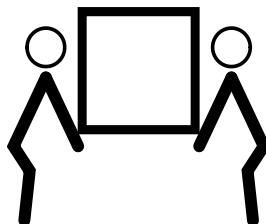
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1. This Technical Manual, TM 11862A-OR, authenticated for Marine Corps use and effective upon receipt, provides Operator/Crew Maintenance Manual with Components List and Repair Parts List for the Shelter Expandable, Mobile Tactical Shelter (MTS), AN/TSQ-272, NSN 5411-01-581-2654.
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SAFETY SUMMARY

The following **WARNINGS** and **CAUTIONS** appear on the page referenced and are listed here for emphasis.

WARNING

DANGEROUS VOLTAGES EXIST IN SYSTEM EQUIPMENT. TO PREVENT PERSONNEL INJURY, DO NOT ATTEMPT REPAIRS WHEN POWER FROM POWER SOURCES AND/OR BATTERY BACKUP IS APPLIED. DISCONNECT ALL POWER WHEN REMOVING EQUIPMENT COVERS OR ACCESS PLATES. (PAGE 2-2)

WARNING

ENSURE VEHICLE GROUNDING STRAPS LOCATED ROADSIDE AND CURBSIDE BENEATH SHELTER ARE CONNECTED ANY TIME SHELTER IS IN USE. FAILURE TO CONNECT GROUNDING STRAPS COULD RESULT IN PERSONNEL INJURY OR DEATH. (PAGE 2-2, 3-12)

WARNING

TO PREVENT PERSONNEL INJURY, USE CARE WHEN INSTALLING AND/OR REMOVING PERIPHERAL AND ASSOCIATED DEVICES. REMOVING EQUIPMENT COVERS AND ACCESS PLATES MAY EXPOSE SHARP EDGES. (PAGE 2-2)

WARNING

ENSURE WHEEL CHOCKS ARE PLACED BEHIND FRONT VEHICLE WHEELS ANY TIME VEHICLE IS STOPPED AND SHELTER IS IN USE. FAILURE TO DO SO COULD RESULT IN PERSONNEL INJURY OR DEATH FROM UNEXPECTED MOVEMENT OF VEHICLE. (PAGE 2-2)

WARNING

ALWAYS OBSERVE PROPER LIFTING AND CARRYING WEIGHT LIMITS. REFER TO MIL-STD-1472 FOR MAXIMUM WEIGHT LIMITS. (PAGE 2-4)

WARNING

REPEATED AND/OR PROLONGED EXPOSURE MAY CAUSE DEFATTING OF SKIN WITH ITCHING, REDNESS, OR RASH. CONTACT WITH VAPOR OR AEROSOL MAY CAUSE EYE IRRITATION WITH TEARING, PAIN, OR BLURRED VISION. INCREASED SUSCEPTIBILITY TO EFFECTS OF THIS MATERIAL MAY BE OBSERVED IN PERSONS WITH PRE-EXISTING DISEASE OF CENTRAL NERVOUS SYSTEM AND CARDIOVASCULAR SYSTEM. (PAGE 2-7)

WARNING

REPEATED AND/OR PROLONGED EXPOSURE MAY CAUSE PERMANENT IMPARED VISION OR BLINDNESS. TO AVOID INJURY TO PERSONNEL, AVOID LOOKING DIRECTLY INTO PATH OF LASER BEAM. (PAGE 2-8)

WARNING

THE BATTERY IS A TWO-MAN LIFT. THE BATTERY IS DIFFICULT TO PICK UP AND MOVE. ENSURE THAT YOU HAVE GOOD FOOTING AND A CLEAR PATH TO BATTERY COMPARTMENT. INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT CAN OCCUR. (PAGE 3-6)

WARNING

TO PREVENT PERSONNEL INJURY OR DEATH, ENSURE ALL CIRCUIT BREAKERS ARE OPEN (OFF) PRIOR TO CONNECTING MTS BATTERY CABLES. (PAGE 3-12)

WARNING

SERIOUS ELECTRICAL HAZARDS EXIST WHEN WORKING WITH VEHICLE/ SHELTER BATTERY SYSTEM. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, TAKE APPROPRIATE PRECAUTIONS. (PAGE 5-12)

WARNING

ENSURE SHELTER GROUNDING HAS BEEN COMPLETED PRIOR TO APPLYING POWER. FAILURE COULD RESULT IN SEVERE PERSONNEL INJURY OR DEATH. (PAGE 5-18, 5-19)

WARNING

SPINNING BLADES ON VENT FANS CAN CAUSE SEVERE INJURY OR AMPUTATION. USE EXTREME CARE TO PREVENT INJURY TO PERSONNEL. (PAGE 5-20)

WARNING

TO AVOID SERIOUS INJURY OR DEATH, ENSURE SYSTEM IS POWERED DOWN PRIOR TO PERFORMING MAINTENANCE. USE PROPER SAFETY EQUIPMENT (SAFETY GOGGLES AND GLOVES) WHEN PERFORMING MAINTENANCE TASKS. (PAGE 6-3)

WARNING

TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, TROUBLESHOOTING MUST BE PERFORMED BY QUALIFIED PERSONNEL. (PAGE 7-1)

WARNING

TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR. (PAGE 7-13, 7-15, 7-18, 7-20, 7-22, 7-25, 7-26, 7-34, 7-37, 7-41, 7-42)

WARNING

ALCOHOL SOLVENTS ARE FLAMMABLE. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME. KEEP CONTAINERS CLOSED WHEN NOT IN USE. USE ONLY IN WELL-VENTILATED AREAS. AVOID PROLONGED BREATHING OF VAPORS OR REPEATED CONTACT WITH SKIN. (PAGE 7-14)

WARNING

TO PREVENT INJURY TO PERSONNEL, CHEMICAL PROTECTIVE GLOVES MUST BE WORN WHEN WORKING WITH SEALING COMPOUND, POLYSULFIDE. INJURY TO PERSONNEL MAY RESULT IF CHEMICALS CONTACT UNPROTECTED SKIN. SMOKING IS PROHIBITED WHEN WORKING WITH FLAMMABLE MATERIALS. (PAGE 7-14, 7-16, 7-17)

WARNING

TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, AIR CONDITIONER IS A MANDATORY 4-MAN LIFT. IF FOUR MALE PERSONNEL ARE NOT AVAILABLE, AIR CONDITIONER MUST BE MOVED WITH MECHANICAL LIFT TO AVOID INJURY TO PERSONNEL. (PAGE 7-16, 7-17)

WARNING

TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT, CONFIRM THAT POWER IS REMOVED BEFORE SLIDING OUT RADIO SHELVES. (PAGE 7-21)

WARNING

SERIOUS ELECTRICAL HAZARDS EXIST WHEN WORKING WITH VEHICLE/MTS BATTERY SYSTEM AND BATTERY CHARGER CONTROL. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, TAKE APPROPRIATE PRECAUTIONS. (PAGE 7-27)

WARNING

TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ALWAYS HANDLE BATTERIES WITH RUBBER GLOVES AND SAFETY GLASSES DUE TO HIGHLY ACIDIC ELECTROLYTE SOLUTION WITHIN BATTERIES. DAMAGE TO EQUIPMENT AND SERIOUS INJURY COULD RESULT FROM SPILLAGE.
(PAGE 7-27)

WARNING

THE BATTERY IS A TWO-PERSON LIFT. THE BATTERY IS DIFFICULT TO PICK UP AND MOVE. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE THAT YOU HAVE GOOD FOOTING AND A CLEAR PATH TO BATTERY COMPARTMENT. (PAGE 7-27)

WARNING

TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE ALL POWER IS REMOVED AND ALL CIRCUIT BREAKERS ARE OPEN BEFORE CONNECTING BATTERIES. (PAGE 7-27)

WARNING

FOR SAFETY, IT IS RECOMMENDED THAT BATTERY CABLES BE LABELED PRIOR TO DISCONNECTION IN ORDER TO ENSURE CABLES ARE RECONNECTED CORRECTLY. (PAGE 7-28)

WARNING

TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT, ALWAYS REMOVE NEGATIVE (-) CABLE FIRST WHEN DISCONNECTING THE BATTERIES. (PAGE 7-28)

WARNING

SERIOUS ELECTRICAL HAZARDS EXIST WHEN WORKING WITH VEHICLE/MTS BATTERY SYSTEM AND BATTERY CHARGER CONTROL. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, TAKE APPROPRIATE PRECAUTIONS. (PAGE 7-29)

WARNING

ALWAYS HANDLE BATTERIES WITH RUBBER GLOVES AND SAFETY GLASSES DUE TO HIGHLY ACIDIC ELECTROLYTE SOLUTION WITHIN BATTERIES. DAMAGE TO EQUIPMENT AND SERIOUS INJURY COULD RESULT FROM SPILLAGE. (PAGE 7-29)

WARNING

HAZARDOUS VOLTAGES EXIST IN SHELTER ALTERNATING CURRENT (AC)/DC ELECTRICAL POWER SYSTEMS. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE ALL ELECTRICAL POWER TO SHELTER IS OFF PRIOR TO BEGINNING. REMOVE ALL INCOMING ELECTRICAL POWER FROM ALL SOURCES, INCLUDING GENERATOR OR VEHICLE BATTERY. (PAGE 7-29, 7-30)

WARNING

CHEMICAL PROTECTIVE GLOVES MUST BE WORN WHEN WORKING WITH SEALING COMPOUND, POLYSULFIDE. INJURY TO PERSONNEL MAY RESULT IF CHEMICALS CONTACT UNPROTECTED SKIN. SMOKING IS PROHIBITED WHEN WORKING WITH FLAMMABLE MATERIALS. (PAGE 7-30)

WARNING

TO AVOID SERIOUS INJURY OR DEATH TO PERSONNEL, ENSURE SHELTER MAIN BREAKER IS IN THE OFF POSITION AND ALL POWER IS REMOVED FROM POWER SUPPLY (INVERTER). (PAGE 7-32)

WARNING

TO PREVENT INJURY TO PERSONNEL, POWER SUPPLY (INVERTER) REQUIRES A TWO-PERSON LIFT. (PAGE 7-32, 7-33)

WARNING

ENSURE THAT MTS IS PROPERLY POSITIONED ON A SUPPORT STRUCTURE CAPABLE OF SUPPORTING 2200 LBS. ENSURE THAT LOAD TEST INSPECTION DATE ON STAND IS CURRENT. FAILURE TO OBSERVE SAFETY PROCEDURES WHEN WORKING UNDER THE MTS COULD RESULT IN INJURY OR DEATH. (PAGE D-21, E-4, E-10)

WARNING

TO PREVENT INJURY OR DEATH TO PERSONNEL, ENSURE HOOKS OF THE LIFTING DEVICE ARE INSPECTED AND SECURELY ATTACHED BEFORE LIFTING MTS. SLINGS AND HOISTS MUST BE PROPERLY CERTIFIED. USE OF AN UNCERTIFIED SLING OR A SLING THAT IS NOT CURRENTLY CERTIFIED MAY RESULT IN EQUIPMENT DAMAGE OR SEVERE INJURY OR DEATH TO PERSONNEL. (PAGE D-26, E-4)

CAUTION

To prevent damage to equipment, always follow appropriate equipment shutdown procedures. If not followed, operational software can be corrupted and system may not reboot. (Page 2-2)

CAUTION

System equipment contains Electrostatic Discharge (ESD)-sensitive circuit components. To prevent damage to equipment, use proper procedures in accordance with (IAW) MIL-STD-1686 when handling, removing, or replacing equipment to prevent ESD damage. (Page 2-2)

CAUTION

To prevent equipment damage, do not attempt repairs when power from power sources and/or battery backup is applied. Disconnect all power when removing equipment covers or access plates. (Page 2-2)

CAUTION

To prevent damage to equipment, remove exterior canvas covers and all items from the exterior rack prior to air conditioner operation. (Page 2-2)

CAUTION

To prevent damage to equipment adhere to a 350 pound (lb) weight limit on the exterior shelf. (Page 2-2)

CAUTION

Mast can easily be cross threaded if correct procedures are not followed. (Page 3-4)

CAUTION

To prevent damage to equipment, perform the procedures below to close and open the battery compartment door. (Page 3-6)

CAUTION

Prior to closing the battery compartment door, ensure the latch pawl, on the inside of the door, is in the 12 o'clock position and door is fully seated to its frame by applying mild pressure to door with free hand. (Page 3-6)

CAUTION

To avoid possible damage to adapter or computer when disconnecting AC adapter, disconnect from electrical outlet first and then from computer. When unplugging connector, always hold plug head to avoid possible damage to adapter or computer. Never pull on cord. (Page 3-10)

CAUTION

To prevent damage to equipment, do not pull out shelves four and five simultaneously. (Page 3-10)

CAUTION

To prevent damage to equipment, remove all stowage from the air conditioner shelf before powering on the air conditioner. (Page 3-13)

CAUTION

If primary and secondary door brace assemblies are released to extend doors fully, ensure cable assemblies at RF 1 and 2 are not crimped or pinched between the exterior door and shelter surfaces. (Page 3-13)

CAUTION

Ensure wall fabric on shelter has been staked down before pulling vehicle away or boot will not fit properly. (Page 3-14)

CAUTION

Ensure CB-1, CB-2, CB-3, CB-12, and CB-19 inside shelter are in open position. Do not apply power to MTS with these CBs in closed position. Doing so could damage CBs and electronic components in shelter. (Page 5-18, 5-19)

CAUTION

To avoid damage to equipment, vehicle should not be in operational mode and engine should be switched off. (Page 5-18, 5-19)

CAUTION

To avoid damage to equipment, remove all items from the exterior shelf before operating the air conditioner. (Page 5-18, 5-19)

CAUTION

To prevent damage to equipment, roll up and secure all ventilation fan covers before operating fans (CB-11). (Page 5-20)

CAUTION

Vent assemblies are crucial to ventilation and cooling of batteries, power systems, data, and voice communications systems in shelter. These vent assemblies must be free of obstructions in order to allow for free flow of air to prevent damage to equipment. (Page 6-3)

CAUTION

To avoid damage to equipment, do not clean with benzene, thinner, alkaline detergent, alcoholic system detergent, glass cleaner, wax, polish cleaner, soap powder, or insecticide. Do not place rubber or vinyl against cabinet for long periods. These types of fluids and fabrics can cause paint to deteriorate, crack, or peel. (Page 6-3)

CAUTION

Systems and subsystems may not be mission-capable if they do not pass maintenance requirements specified. (Page 6-3)

CAUTION

To prevent damage to equipment, do not over-tighten bracket against shelter wall. (Page 7-18)

CAUTION

To prevent damage to equipment, do not install adhesive in temperatures above 80 degrees F. (Page 7-18)

CAUTION

To prevent damage to equipment, maintain a distance of .41 inches (13/32 inches) between the rain guard and the shelter wall. (Page 7-18)

CAUTION

To prevent damage to equipment in the unlikely event that the primary personnel door latch assembly fails and access to the MTS is not possible, refer to TM 10-5411-235-13&P and Addendum and the procedure below. (Page 7-43)

CAUTION

Pneumatic tools shall not be used during installation or removal process. Severe damage to equipment could result.
(Page D-3)

CAUTION

To prevent damage to equipment, lubricate all screws and bolts prior to installation and removal. (Page D-4, E-4)

CHAPTER 1

GENERAL INFORMATION

1-1. INTRODUCTION.

This SHELTER EXPANDABLE Technical Manual (TM) describes the operations, equipment, and basic equipment installation and configuration to operate the SHELTER EXPANDABLE (Mobile Tactical Shelter (MTS)), AN/TSQ-272, hereafter referred to as MTS or shelter, to operate equipment safely and efficiently. This manual also addresses maintenance and troubleshooting procedures.

CAUTION

Read this manual thoroughly before system operation. Careful observation of enclosed instructions and procedures ensures maximum equipment employment and minimizes possibility of damage to equipment and system operability deficiencies.

NOTE

This TM does not address operations of AFATDS.

The MTS is capable of utilizing the Advanced Field Artillery Tactical Data System (AFATDS). The AFATDS is a field artillery tactical data system incorporating Commercial Off-The-Shelf (COTS) computer systems, tactical radio systems, and a software program for tactical operations integrated into a MTS.

AFATDS is an integrated fire support Command and Control (C2) system that processes fire missions and related information to coordinate and optimize all fire support assets, including mortars, field artillery, cannon, missiles, air support, and naval gunfire. It automates and facilitates fire support planning and current operations. AFATDS provides real-time battlefield information, target analysis, and unit status while coordinating target damage assessment and sensor operations.

NOTE

Corrosion prevention and control is a continuing concern. Immediately report corrosion problems with the shelter to organizational maintenance to correct the issue and prevent future problems.

1-2. DESCRIPTION OF TECHNICAL MANUAL.

This manual presents system-wide functional data on MTS and details specific systems and pieces of equipment that comprise each functional unit.

- Chapter 1 – General Information: Introduction to shelter, systems, equipment, and associated system equipment.
- Chapter 2 – Safety Precautions: Vital information designed to preserve personnel safety and prevent damage or destruction of equipment.
- Chapter 3 – Installation: Methods and correct order of installing equipment from stowed or transport mode to operational mode.
- Chapter 4 – Functional Description: Functional areas within the shelter and specific equipment that performs those functions.
- Chapter 5 – Operation: Proper instructions for operations, including power up and power down.
- Chapter 6 – Scheduled Maintenance: Required and recommended maintenance schedules to keep equipment performing properly.
- Chapter 7 – Alignment Procedures/Corrective Maintenance: Troubleshooting procedures. Remove and replace procedures.

- Chapter 8 – Repair Parts List: Illustrations, descriptions, and stock numbers for replacement parts.
- Appendix A – Acronyms and Abbreviations: List of acronyms and abbreviations used throughout the TM.
- Appendix B – Expendable/Durable Supplies and Materials List: Lists all expendable supplies and materials within subsystems.
- Appendix C – Components of End Item: Identifies every system component item used in MTS.
- Appendix D – Mobile Tactical Shelter Installation to Vehicle: Provides procedures for installation of the MTS onto the High Mobility Multipurpose Wheeled Vehicle (HMMWV).
- Appendix E – Mobile Tactical Shelter Removal from Vehicle: Provides procedures for the removal of the MTS from the HMMWV.
- Appendix F – Mobile Tactical Shelter Operating Restrictions: Lists operating restrictions to ensure force protection.

1-3. PHYSICAL ARRANGEMENT.

The MTS is mounted on a HMMWV and houses the AFATDS and communications equipment components in order to conduct fire support operations. All systems inside the shelter are powered by two batteries accessed through the battery door on the curbside exterior wall of shelter.

The MTS has five antennas, four RF-390A/VRC and one AS-3449/VSQ-1, mounted on outside walls. The air conditioner is mounted on a shelf on the front wall above the HMMWV cab. All other equipment is located and accessed inside the shelter.

1-4. SHELTER EXTERIOR.

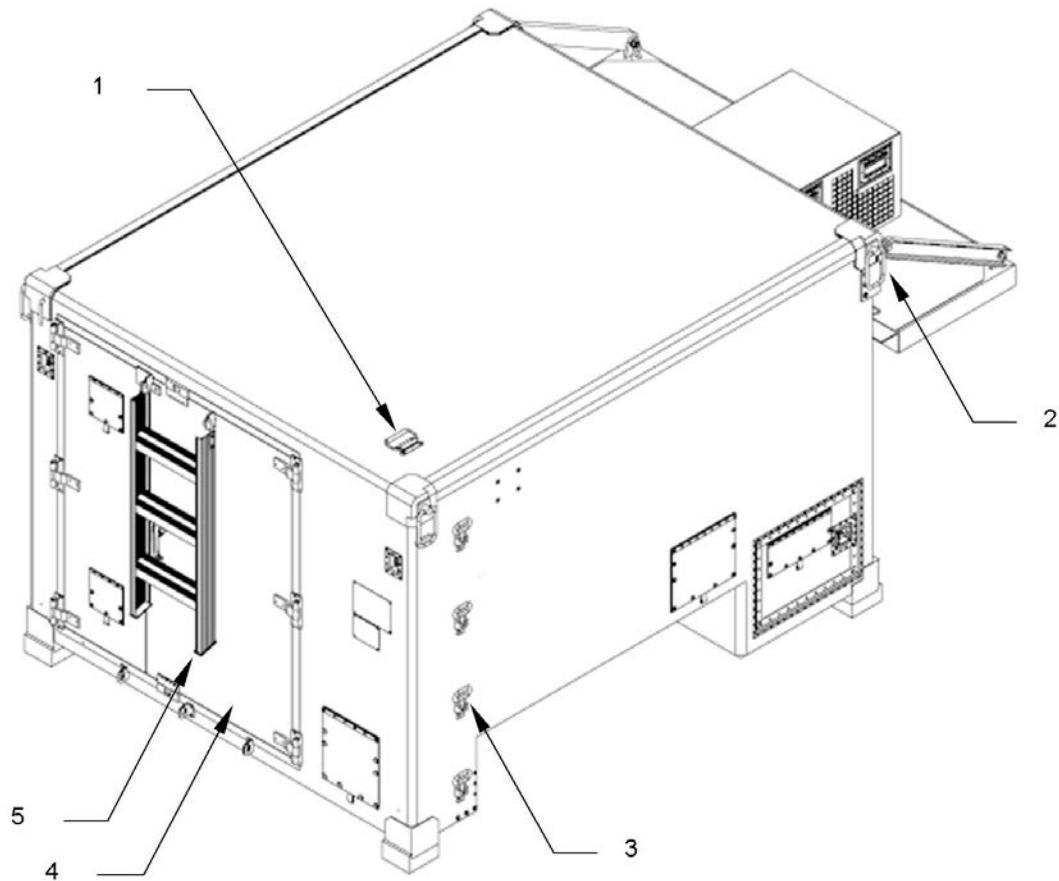


Figure 1-1. Shelter Exterior

Table 1-1. Shelter Exterior Components

Key	Components	Function
1	Roof handhold	Used to assist operator when accessing shelter roof.
2	Lifting rings	Used to raise shelter when mounting or dismounting from vehicle.
3	Roof access steps	Used by operator to gain access to shelter roof.
4	Personnel door	Used to enter and exit shelter during normal operation.
5	Personnel ladder	Used to access shelter when installed on HMMWV.

Shelter. MTS is a lightweight transportable shelter used to house AFATDS support equipment. Refer to Figure 1-1 and Table 1-1 for shelter exterior components.

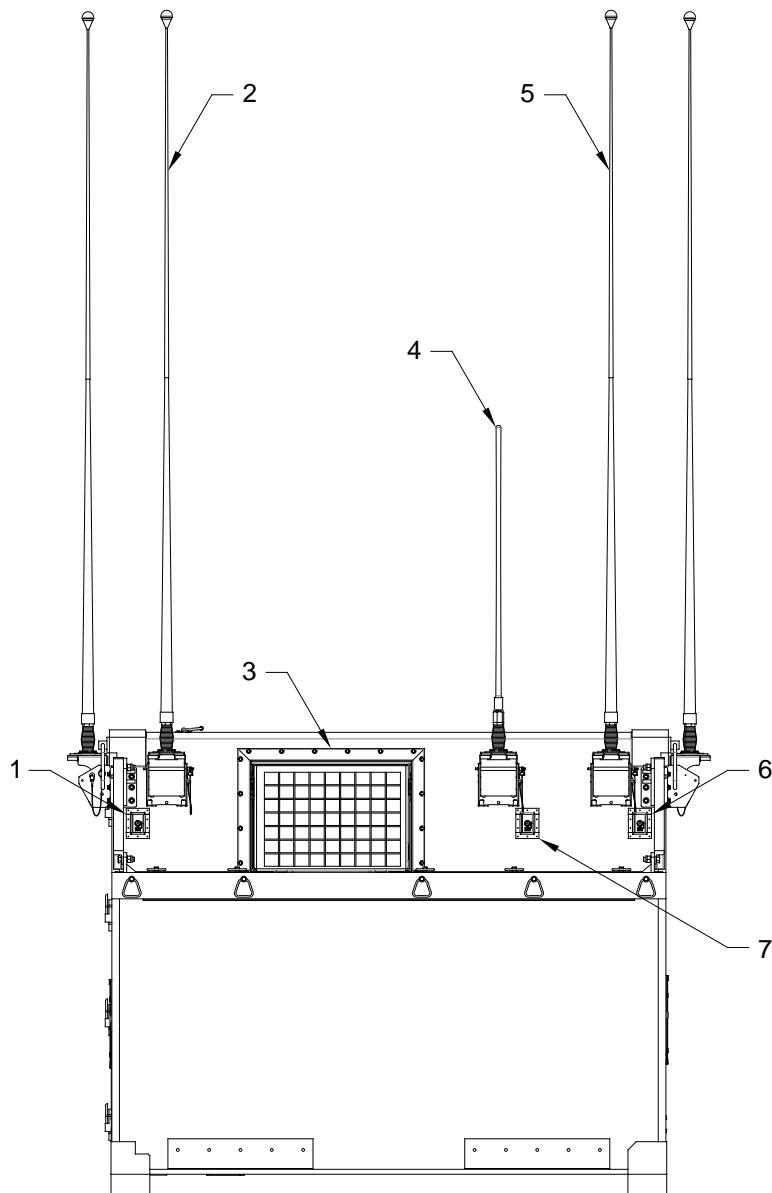


Figure 1-2. Shelter Exterior Front Wall

Table 1-2. Shelter Exterior Front Wall Components

Key	Components	Function
1	RF pass through	Provides a pass through for the antenna.
2	RF-390A/VRC antenna	UHF/VHF antenna.
3	Air conditioner	Supplies heating and cooling to the MTS.
4	AS-3449/VSQ-1 antenna	EPLRS Omni-directional antenna.
5	RF-390A/VRC antenna	UHF/VHF antenna.
6	RF pass through	Provides a pass through for the antenna.
7	RF pass through	Provides a pass through for the antenna.

(1) Shelter Exterior Front Wall. Front wall of shelter features air conditioner, two RF-390A/VRC antennas, and one AS-3449/VSQ-1 antenna. Refer to Figure 1-2 for a view of shelter exterior front wall. Refer to Table 1-2 for a description of shelter exterior front wall components.

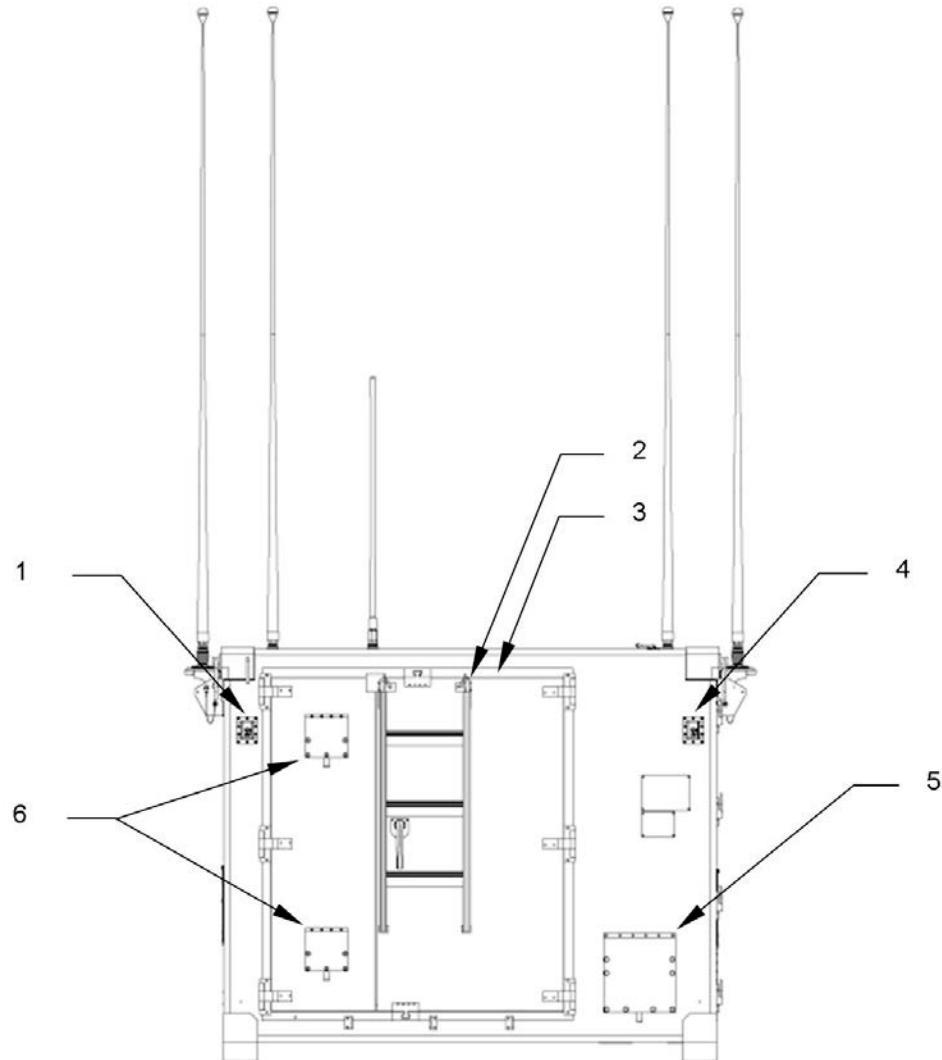


Figure 1-3. Shelter Exterior Rear Wall

Table 1-3. Shelter Exterior Rear Wall Components

Key	Components	Function
1	RF pass through	Provides a pass through for the antenna.
2	Ladder assembly	Entry means to shelter when mounted on High Mobility Multipurpose Wheeled Vehicle (HMMWV).
3	Personnel door	Access to shelter interior.
4	RF pass through	Provides a pass through for the antenna.
5	TIP	Provides three AC power connections and two Ethernet connections.
6	Vent fan	Exchanges air inside shelter with air from outside.

(2) Shelter Exterior Rear Wall. Rear exterior wall of shelter features, primary and secondary personnel doors, two vent fans that exchange air inside shelter with outside air (on the secondary door), a personnel ladder (on the primary door), Tent Interface Panel (TIP), and two RF-390A/VRC antennas. Refer to Figure 1-3 for a view of shelter exterior rear wall. Refer to Table 1-3 for a description of shelter exterior rear wall components.

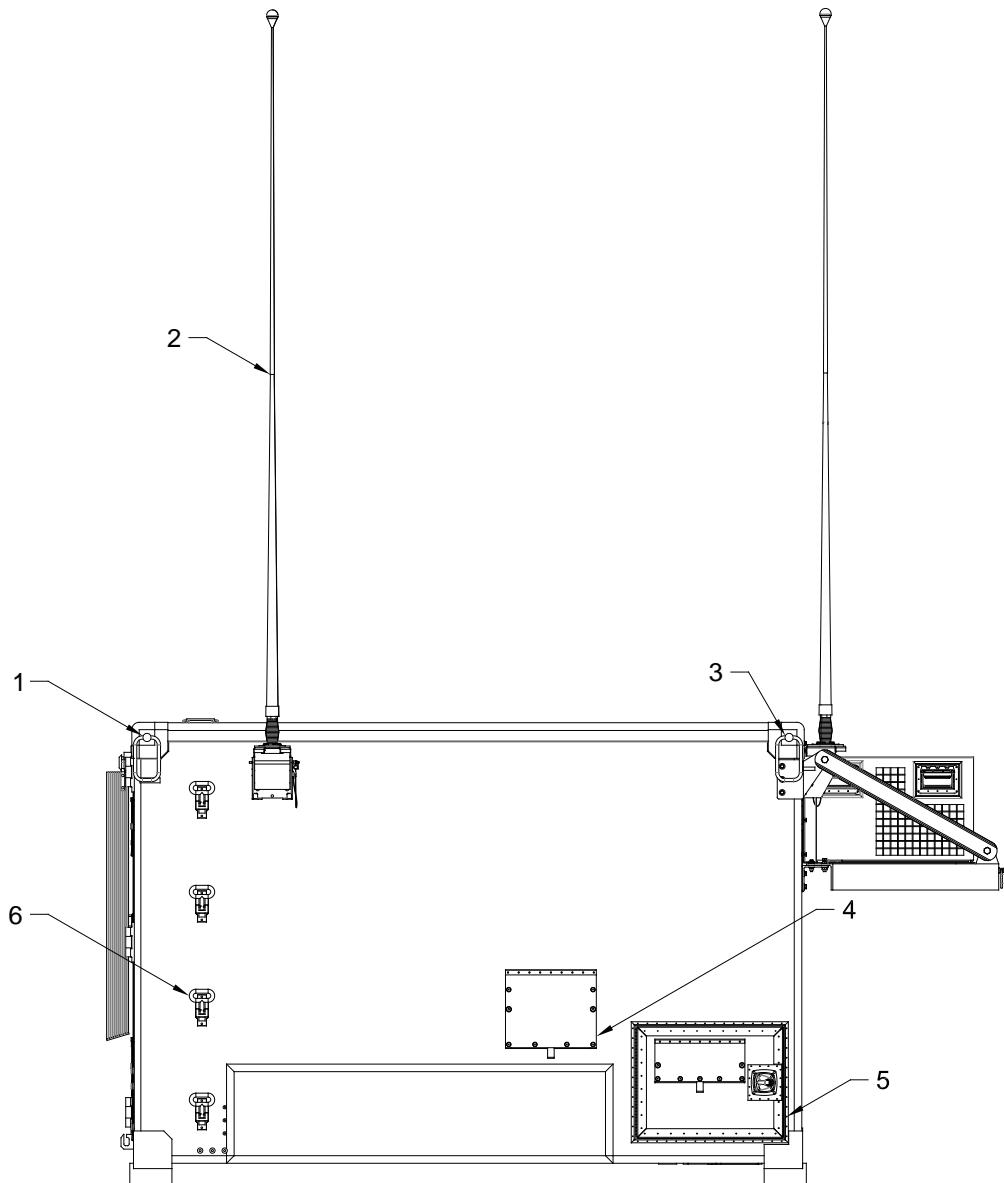


Figure 1-4. Shelter Exterior Curbside Wall Components

Table 1-4. Shelter Exterior Curbside Wall Components

Key	Components	Function
1	Lifting ring	Used to crane lift shelter onto or off of HMMWV.
2	RF-390A/VRC	UHF/VHF antenna.
3	Lifting ring	Used to crane lift shelter onto or off of HMMWV.
4	Power Entry Panel	Provides one J1 connector and one E1 connector for optional external generator.
5	Battery compartment	Provides access to MTS batteries.
6	Shelter step assembly	Provides access to shelter roof.

(3) **Shelter Exterior Curbside Wall.** Curbside exterior wall of shelter features battery access, Power Entry Panel, RF-390A/VRC antenna, and fold-down roof access ladder. Refer to Figure 1-4 for a view of shelter exterior curbside wall. Refer to Table 1-4 for a description of shelter exterior curbside wall components.

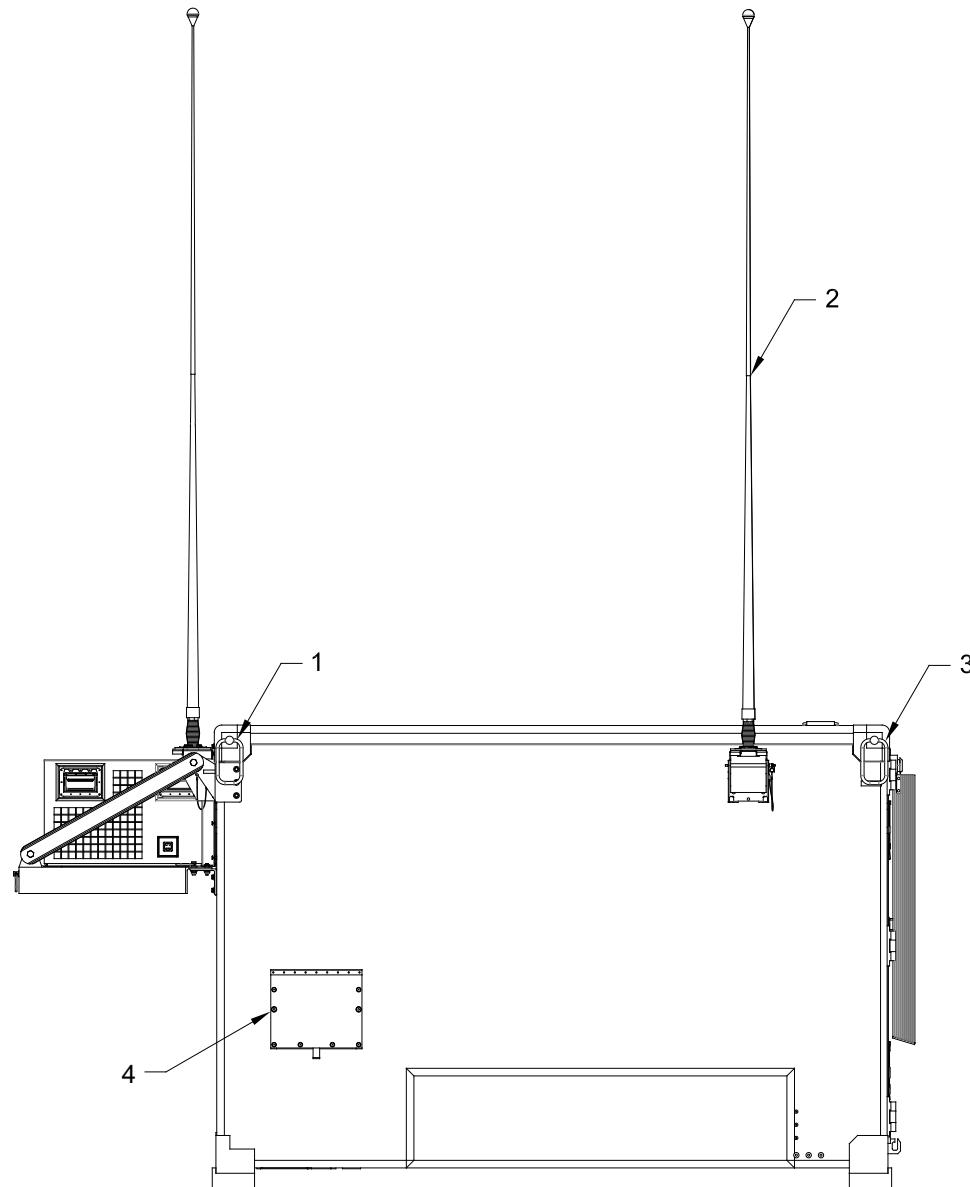


Figure 1-5. Shelter Exterior Roadside Wall Components

Table 1-5. Shelter Exterior Roadside Wall Components

Key	Components	Function
1	Lifting ring	Used to crane-lift shelter onto or off of HMMWV.
2	RF-390A/VRC antenna	UHF/VHF antenna.
3	Lifting ring	Used to crane lift shelter onto or off of HMMWV.
4	Signal Entry Panel	Provides five RF connectors and two Ethernet connectors.

(4) Shelter Exterior Roadside Wall. Roadside exterior wall of shelter features a RF-390A/VRC antenna and a Signal Entry Panel that provides RF and Ethernet connectors for external equipment to interface with shelter equipment. Refer to Figure 1-5 for a view of shelter exterior roadside wall. Refer to Table 1-5 for a description of shelter exterior roadside wall components.

1-5. SHELTER INTERIOR.

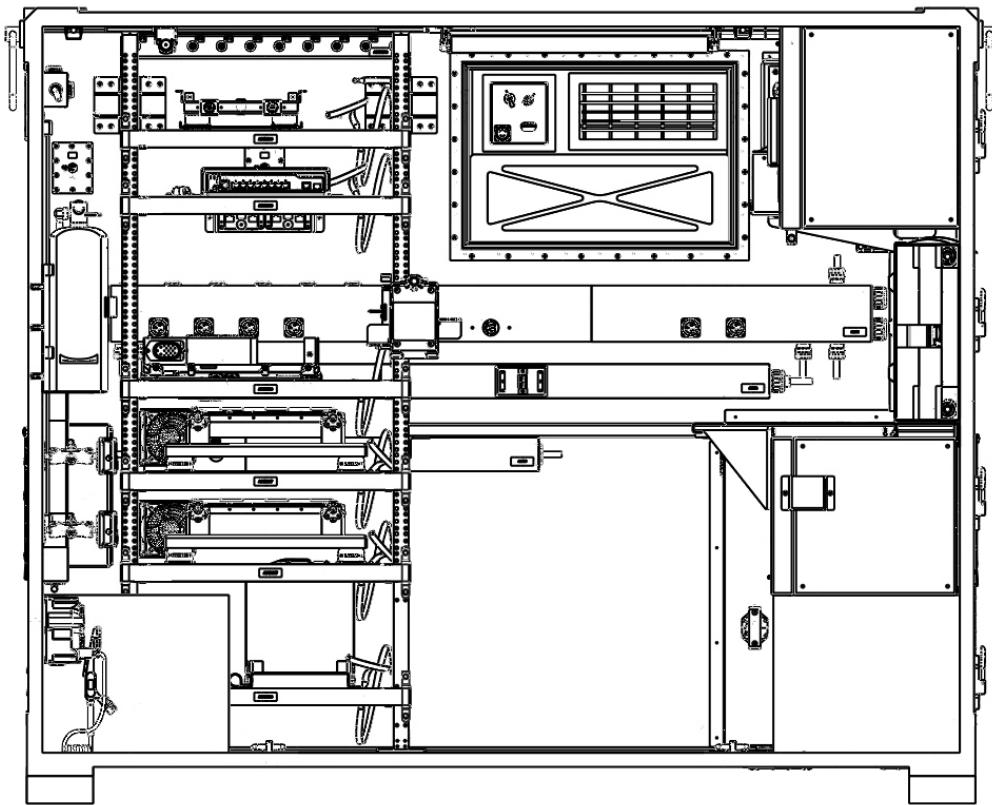


Figure 1-6. Shelter Interior

Shelter Interior. Refer to Figure 1-6 for a view of shelter interior. Refer to Figure 1-7 through Figure 1-11 for additional information on this view.

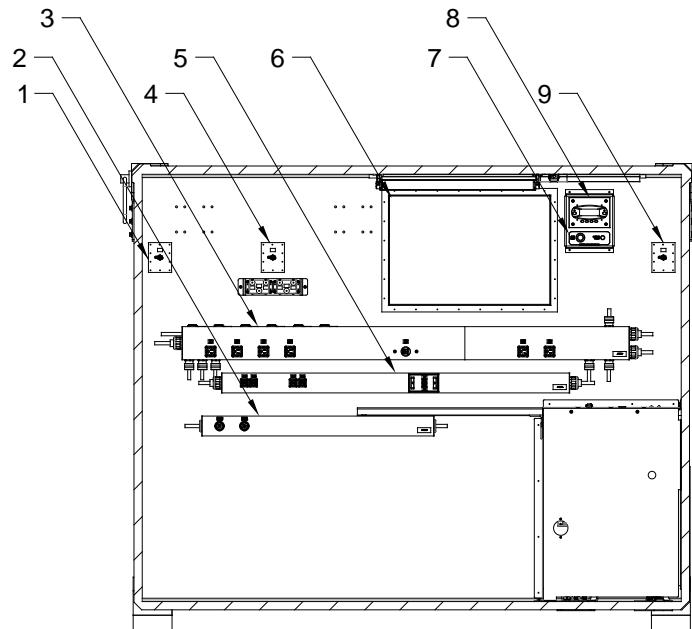


Figure 1-7. Shelter Interior Front Wall

Table 1-6. Shelter Interior Front Wall Components

Key	Control or Indicator	Function
1	RF pass through	Provides a pass through for the antenna cable.
2	Power raceway	Houses power cables for PCC.
3	AC/DC power raceway	Houses AC/DC power cables for radio rack components.
4	RF pass through	Provides a pass through for the antenna.
5	LAN raceway	Houses LAN cables for radio rack components.
6	Air conditioner	Provides heating and cooling for shelter interior.
7	Battery charger remote control	Allows the user visibility and control of the battery charger control located in the battery compartment.
8	Digital Display Indicator	Allows the user visibility and control of the power supply (inverter) located in the battery compartment.
9	RF pass through	Provides a pass through for the antenna.

(1) Shelter Interior Front Wall. Interior front wall of shelter features radio rack, air conditioner, and three raceways. Also included is the radio rack, illustrated in Figure 1-11. One raceway houses Alternating Current (AC)/Direct Current (DC) power cables for radio rack components, one houses Local Area Network (LAN) cables for radio rack components, and one houses power cables for AFATDS Power Conditioner/Converter (PCC). Refer to Figure 1-7 for a view of shelter interior front wall. Refer to Table 1-6 for a description of shelter interior front wall components.

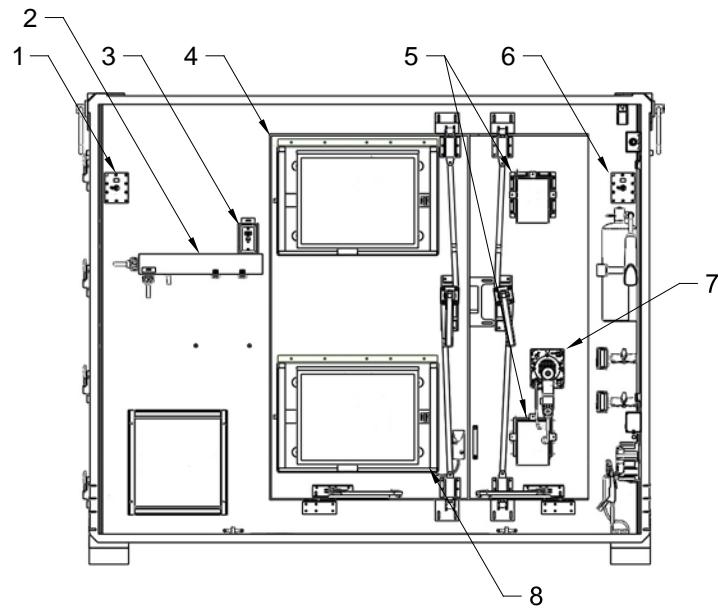
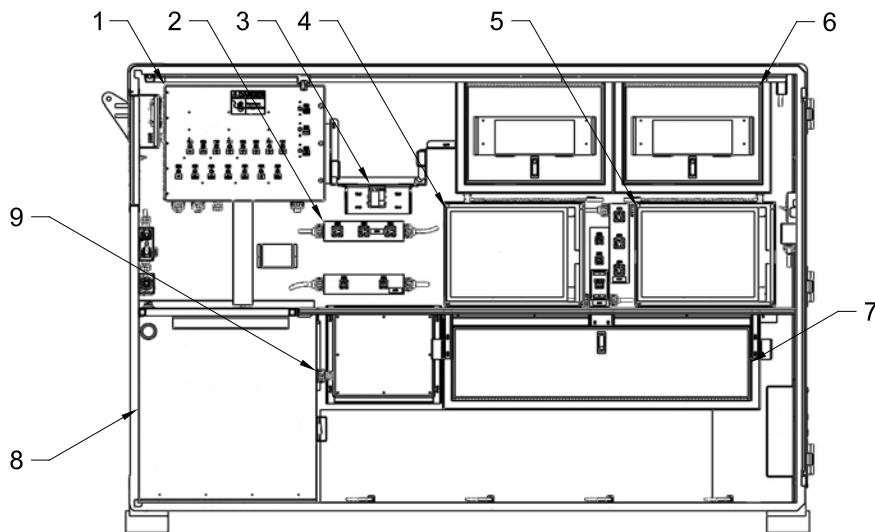


Figure 1-8. Shelter Interior Rear Wall and Doors

Table 1-7. Shelter Interior Rear Wall and Doors Components

Key	Components	Function
1	RF connection point	Connection point for curbside RF-390A/VRC antenna.
2	AC power raceway	Provides two AC power receptacles.
3	Toggle switch	When in ON position, illuminates white with personnel door closed and red with personnel door open.
4	Display unit	Displays same information as display unit #1. See Table 1-8 for more detail.
5	Vent fans	Exchange air inside shelter with air from outside.
6	RF connection point	Connection point for roadside RF-390A/VRC antenna.
7	Handset , Speakers	Telephone-style handset and speakers for use with AN/VRC-110 radios located in HMMWV cab.
8	Display unit	Displays same information as display unit #2. See Table 1-8 for more detail.

(2) Shelter Interior Rear Wall. Interior rear shelter wall features two vent fans (on secondary door), radio handset, two display units (on primary door), interior light switch, and AC power raceway. Refer to Figure 1-8 for a view of shelter rear wall and doors. Refer to Table 1-7 for a description of shelter interior rear wall and doors components.

**Figure 1-9. Shelter Interior Curbside Wall Components****Table 1-8. Shelter Interior Curbside Wall Components**

Key	Components	Function
1	PDU	Shelter CB panel.
2	Power raceway	Used to route cables throughout the MTS.
3	RF power divider	Splits signal from one computer to two different display units.
4	CS display unit #1	Works in conjunction with top computer and door display unit #1.
5	CS display unit #2	Works in conjunction with bottom computer and door display unit #2.
6	Upper Cabinets	Provides storage space. Keyboard mounts are located on front of cabinet.
7	Lower cabinet	Provides storage space. The mouse brackets are located on side of cabinet.
8	Battery compartment	Battery storage area.
9	Circuit breaker 19	Provides power from the vehicle batteries.

(3) Shelter Interior Curbside Wall. Interior curbside shelter wall includes two display units, two keyboards, two mouse devices, two RF power dividers, Power Distribution Unit (PDU), and AFATDS printer shelf. Refer to Figure 1-9. Shelter Interior Curbside Wall Components

(4) Table 1-8. Shelter Interior Curbside Wall Components

Key	Components	Function
1	PDU	Shelter CB panel.
2	Power raceway	Used to route cables throughout the MTS.
3	RF power divider	Splits signal from one computer to two different display units.
4	CS display unit #1	Works in conjunction with top computer and door display unit #1.
5	CS display unit #2	Works in conjunction with bottom computer and door display unit #2.
6	Upper Cabinets	Provides storage space. Keyboard mounts are located on front of cabinet.
7	Lower cabinet	Provides storage space. The mouse brackets are located on side of cabinet.
8	Battery compartment	Battery storage area.
9	Circuit breaker 19	Provides power from the vehicle batteries.

(5) for a view of shelter interior curbside wall. Refer to Table 1-8 for a description of shelter interior curbside wall components.

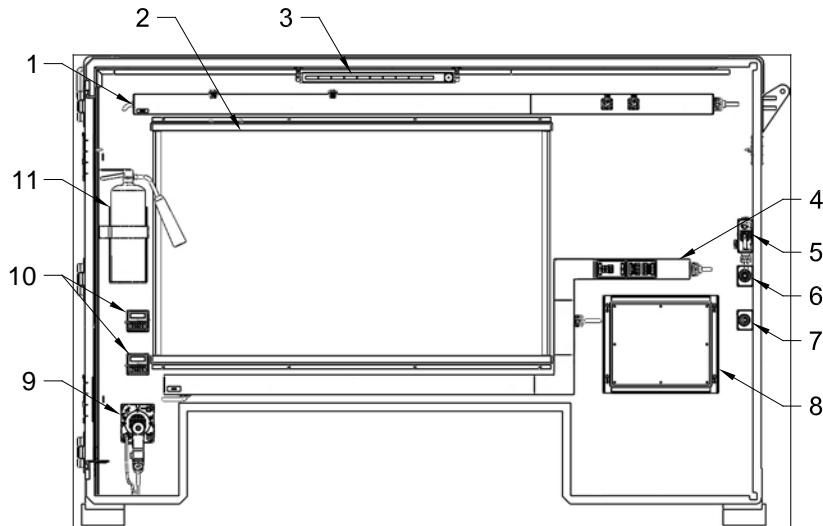
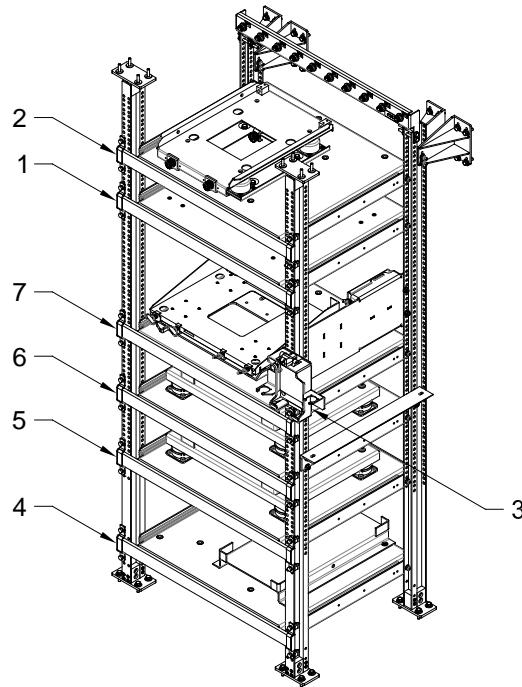


Figure 1-10. Shelter Interior Roadside Wall Components

Table 1-9. Shelter Interior Roadside Wall Components

Key	Components	Function
1	Power raceway	AC power raceway with two AC receptacles.
2	Plotting board	Standard plotting board.
3	Light fixture	Lights for interior shelter.
4	Power raceway	AC power raceway with two AC receptacles.
5	2-port RF power divider	Splits the signal from the computer to the display units.
6	4-port RF power divider	Splits the signal from the computer to the display units.
7	RF power divider power supply	Supplies power from the AC raceway to the RF power dividers
8	Signal entry panel	Interior of roadside signal entry panel.
9	Loud speaker control unit	Allows personnel in the rear of the MTS to communicate with the radios in the cab of the vehicle.
10	KDUs	Remote radio keypad display units.
11	Fire extinguisher	Standard fire extinguisher for type B and C fires.

(6) Shelter Interior Roadside Wall. Equipment located on interior roadside of shelter includes plotting board, fire extinguisher, AC power raceway, signal entry panel, Keyboard Display Units (KDUs), loud speaker control unit, and cable raceway. An overhead light is located above the plotting board. Refer to Figure 1-10 for a view of the shelter interior roadside wall. Refer to Table 1-9 for a description of shelter interior roadside components.

**Figure 1-11. Shelter Interior Radio Rack****Table 1-10. Shelter Interior Radio Rack Equipment**

Key	Equipment	Function
1	ADP interface unit shelf	Contains mount for ADP interface unit.
2	EPLRS shelf	Contains EPLRS mounting tray.
3	EPLRS URO bracket	Bracket for EPLRS user read-out.
4	PCC shelf	Contains mount for unit-supplied PCC.
5	Bottom computer shelf	Contains bracket for AFATDS computer.
6	Top computer shelf	Contains bracket for AFATDS computer.
7	AN/VRC-110 shelf	Contains mount for AN/VRC-110 radio.

NOTE

- All equipment located on radio rack is unit supplied with exception of radio shock mounts, ADP interface unit, and EPLRS User Read Out (URO).
- AFATDS computers are unit supplied. The computer described in this section represents typical installation and may vary between units.

(7) Radio Rack. Radio rack components include Automated Data Processing (ADP) interface unit and mounts for the following: Enhanced Position Location and Reporting System (EPLRS) radio assembly, one AN/VRC-110 radio with Single Channel Ground-to-Air Radio Systems (SINCGARS), EPLRS URO with bracket, two computers, and AFATDS PCC. Refer to Figure 1-11 for a view of the shelter radio rack. Refer to Table 1-10 for a description of shelter radio rack components.

1-6. SYSTEM EQUIPMENT.

Listed below are descriptions of major systems and subsystems integrated into the shelter.

a. Shelter. MTS uses a Type V Lightweight Multipurpose Shelter (LMS) mounted on the HMMWV. The shelter features a double-rear personnel door, exterior battery compartment, roof ladder access, and ladder.

(1) Antennas. MTS uses five antennas with antenna mounts: four RF-390A/VRC Multi-band (M-B) vehicular antennas and one AS-3449/VSQ-1 Omni-directional antenna.



Figure 1-12. RF-390A/VRC Multi-band Vehicular Antenna

(a) RF-390A/VRC Multi-band Vehicular Antenna. RF-390A/VRC MB Antenna is designed to provide exceptional gain and instantaneous bandwidth performance over 30 Megahertz (MHz) to 512 MHz spectrum. It includes Mean Time Between Failure (MTBF) of more than 100,000 hours, capability of operation in 55 knot winds with gusts up to 85 knots, and capability of operation with 4.5 pounds per square inch (psi) of ice coating on antenna. Refer to Figure 1-12 for a view of the RF-390A/VRC M-B vehicular antenna.



Figure 1-13. AS-3449/VSQ-1 Omni-directional Antenna

(b) AS-3449/VSQ-1 Antenna. Designed for use with the Enhanced Position Location Reporting System (EPLRS) Vehicle Radio Set AN/VSQ-1. Antenna includes a MTBF of more than 100,000 hours, capability of operation in 55 knot winds with gusts up to 85 knots, and capability of operation with 4.5 pounds of per square inch of ice coating on the antenna. Refer to Figure 1-13 for a view of the AS-3449/VSQ-1 Omni-directional antenna.

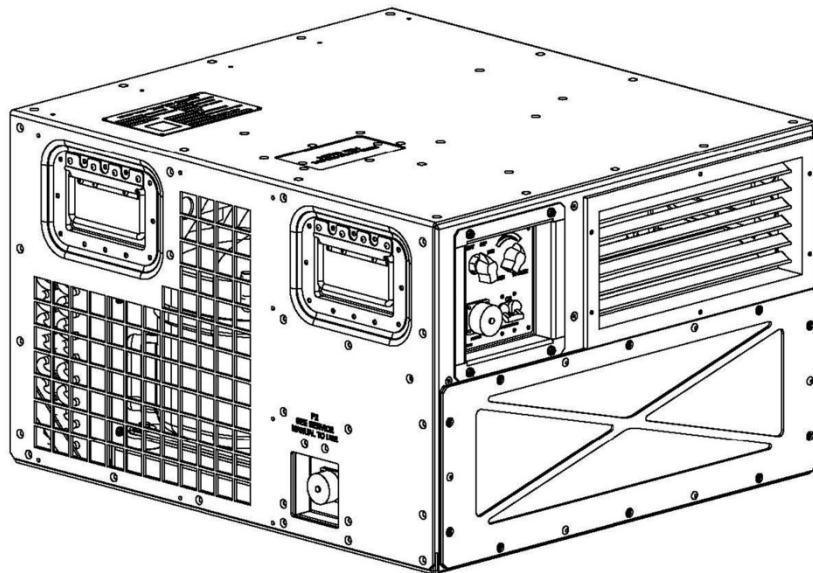


Figure 1-14. Air Conditioner

(2) Air Conditioner. Provides climate-controlled air in shelter. It operates using 120 volts AC single-phase 50/60 Hertz (Hz) power. Refer to TM 11453A/11453B-OI for additional information on air conditioner. Refer to Figure 1-14 for a view of the shelter air conditioner.

Shelters may be furnished with one of two models of air conditioners: Model GSQ346ZABNW00G1 that uses R-22 refrigerant, which is being phased out to model GSQ386ZABNW0011 that uses R-407 refrigerant.

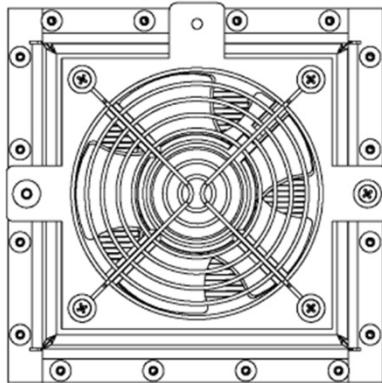


Figure 1-15. Impeller Fan

(3) Axial Impeller Fans. Shelter contains six impeller fans that exchange inside air with outside air for continuous circulation. There are two on rear personnel door and two on battery compartment door. There are also two axial impeller fans on third and fourth shelf of radio rack behind AFATDS computers. These fans prevent AFATDS computers from overheating. Refer to Figure 1-15 for a view of the impeller fan.

(4) Lighting. Shelter features overhead lights controlled by a light switch beside rear door. Default setting automatically switches overhead lights from white light to red light when door is opened to maintain light discipline. MTS also provides two panel, lights at each workstation on curbside wall. Panel, lights automatically power on when Circuit Breaker (CB) 10 is placed in the closed (ON) position. Panel, lights also feature the automatic red light function.

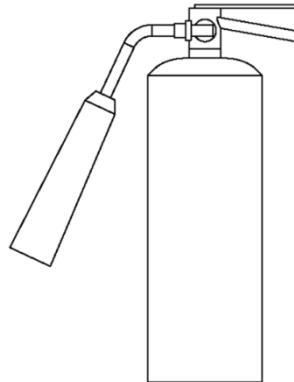


Figure 1-16. Fire Extinguisher

(5) Fire Extinguisher. Shelter provides a residue-free carbon dioxide hand-held fire extinguisher for Type B (flammable and combustible liquids) and Type C (involving energized electrical equipment) fires. Extinguisher is mounted on roadside wall near personnel door. Refer to Figure 1-16 for a view of shelter fire extinguisher.

(6) Plotting Board. A standard plotting board is provided on interior roadside of shelter. Plotting board cannot be removed or repositioned. Use standard plotting board markers and cleaners to prevent damage to plotting board.

b. Power Distribution Subsystem. Controls the distribution of AC & DC power throughout the shelter. Shelter is supplied AC power from external generator or DC power from on-board batteries or HMMWV alternator.

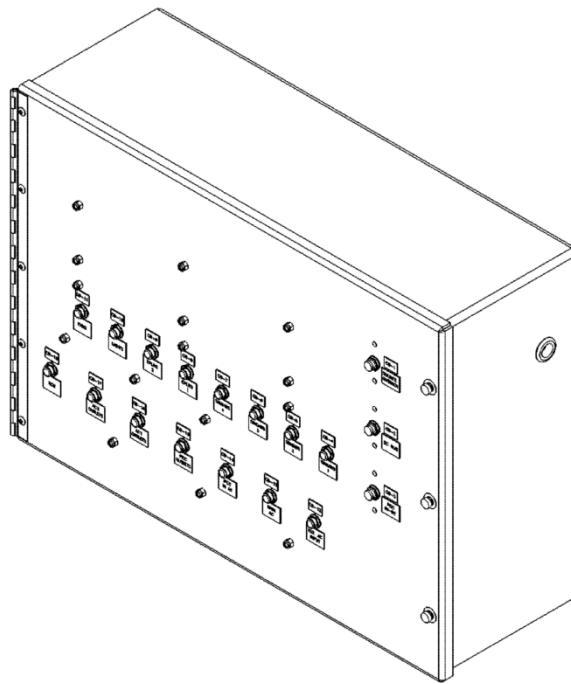
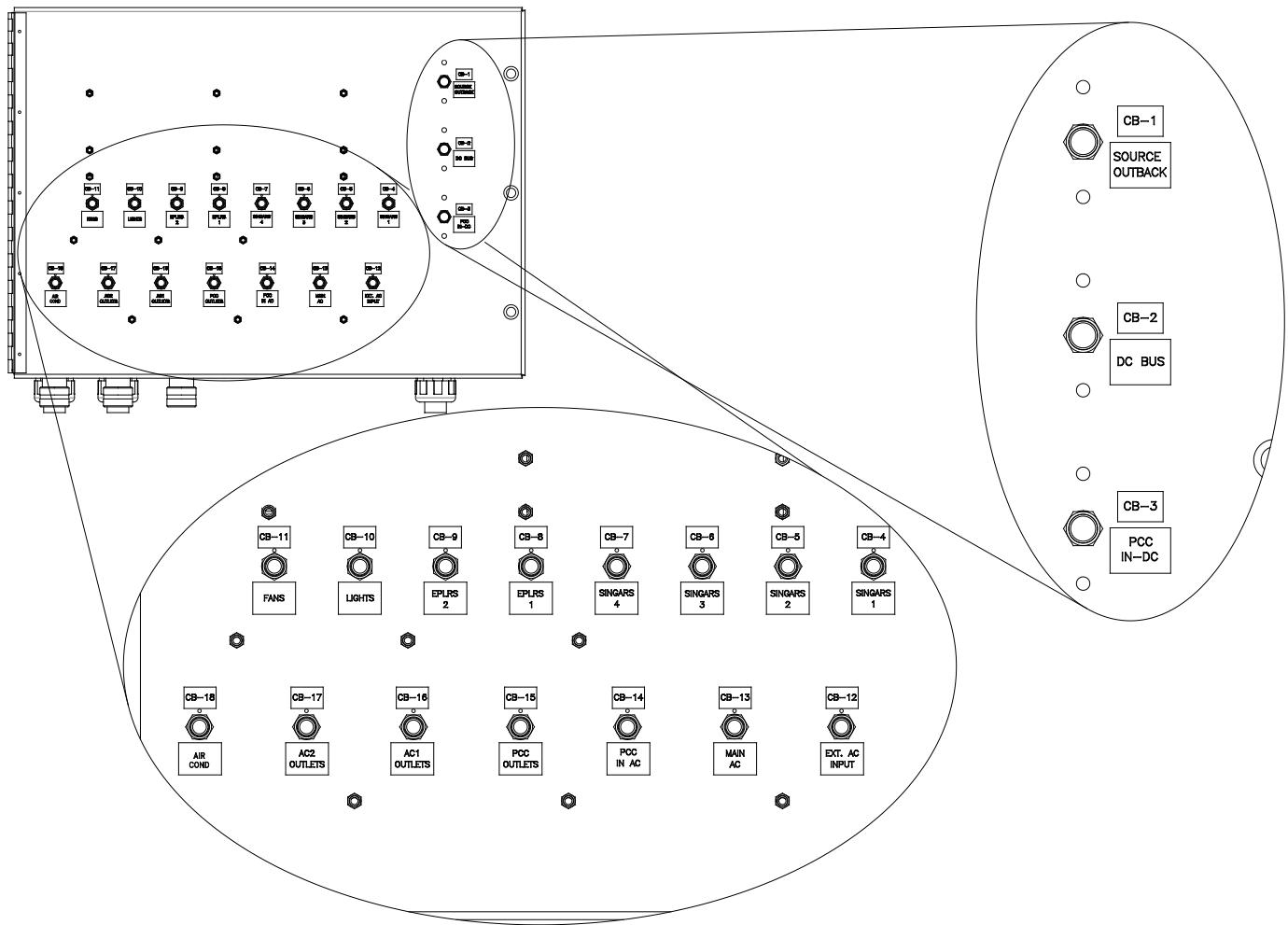
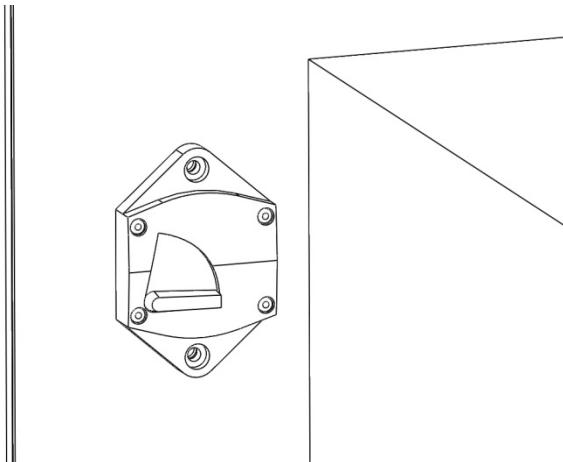


Figure 1-17. Power Distribution Unit (Side View)

**Figure 1-18. Power Distribution Unit (Front View)**

(1) Power Distribution Unit. The PDU features the main CB that applies power to entire shelter and individual CBs that apply power to system equipment. Refer to Figure 1-17 and Figure 1-18 for front and side views of the PDU.

**Figure 1-19. Circuit Breaker 19**

(a) Power Disconnect Breakers. Disconnect CBs are located in upper right corner of PDU front panel. CB-1 (200 ampere (amp)) isolates power supply (inverter) from shelter battery bank when open. CB-19 (150 amp) isolates the shelter battery bank from HMMWV battery bank when open. CB-19 is located below the PDU on the side of the battery box. Refer to Figure 1-19 for a depiction of CB-19.

Table 1-11. Power Distribution Subsystem Circuit Breakers

CB	Description	Function
CB-1	SOURCE OUTBACK	Main DC CB. Removes all power from shelter when open. DC source for the power supply (inverter)
CB-2	DC BUS	Removes all DC power from shelter interior when open. Power is still present at power supply (inverter).
CB-3	PCC IN-DC	DC power source for PCC.
CB-4	SINGCARS 1	Provides DC power to SINCGARS outlets, one per outlet.
CB-5	SINGCARS 2	Provides DC power to SINCGARS outlets, one per outlet.
CB-6	SINGCARS 3	Provides DC power to SINCGARS outlets, one per outlet.
CB-7	SINGCARS 4	Provides DC power to SINCGARS outlets, one per outlet.
CB-8	EPLRS 1	Provides DC power to the EPLRS 1.
CB-9	EPLRS 2	Provides DC power to the EPLRS 2.
CB-10	LIGHTS	Provides DC power to the lighting system.
CB-11	FANS	Provides DC power to the fans.
CB-12	EXT. AC INPUT	Provides AC from an external source.
CB-13	MAIN AC	Provides AC power from power supply (inverter).
CB-14	PCC IN AC	Provides AC power to PCC.
CB-15	PCC OUTLETS	Provides AC power from PCC.
CB-16	AC 1 OUTLETS	Powers AC 1 outlets in shelter.
CB-17	AC 2 OUTLETS	Powers AC 2 outlets in shelter.
CB-18	AIR COND	Powers AC to air conditioner.
CB-19	VEHICLE 24 VDC	Provides DC power from the vehicle batteries.

(b) Individual Breakers. MTS uses two types of CBs, AC and DC. DC CBs control voltage from MTS batteries. AC CBs control voltage from the power supply (inverter). Refer to Table 1-11 for a list of individual CBs and their function and description.

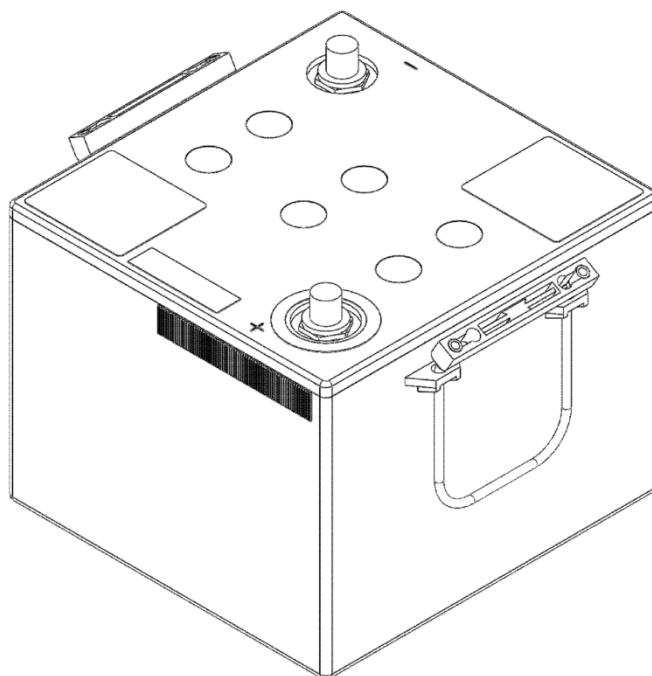


Figure 1-20. Mobile Tactical Shelter Battery

(2) MTS Battery. MTS uses two 12 V storage batteries connected in series to provide 24 V power and are designed for virtually maintenance-free operation. Batteries provide reserve capacity of 240 minutes, a shelf life of 30 months, and a cradle-to-grave life of at least 48 months. Refer to Figure 1-20 for a view of MTS battery.

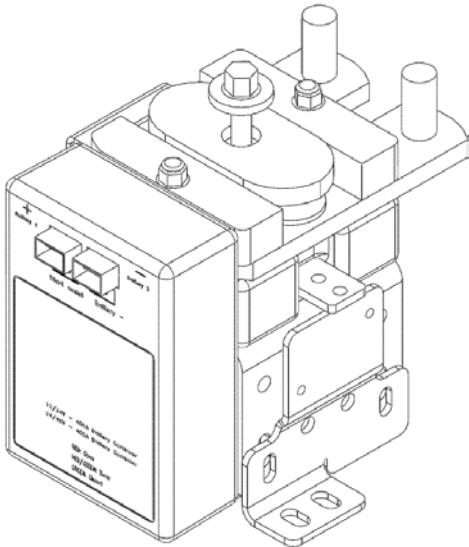


Figure 1-21. Battery Charger Control

(3) Battery Charger Control. Automatically combines multiple batteries when charging sources are available. Automatically disconnects the starting battery from system loads when there are no active charging sources. This ensures that the starting battery is always full. Refer to Figure 1-21 for a view of MTS battery charger control.

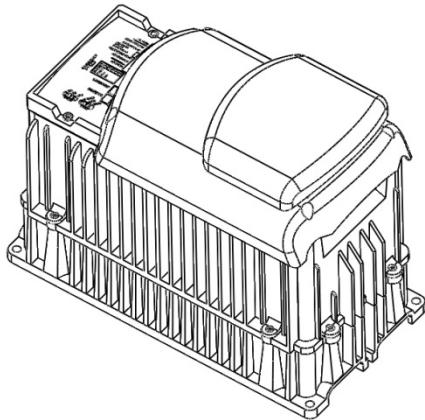


Figure 1-22. Power Supply (Inverter)

(4) Power Supply (Inverter). Provides utility-supplied electricity that is generated, monitored, and controlled by external systems. Refer to Figure 1-22 for a view of shelter power supply (inverter).

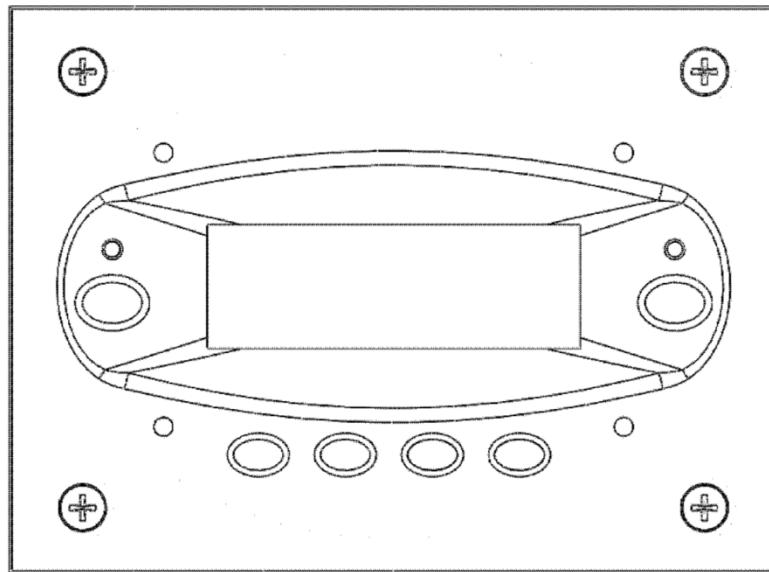


Figure 1-23. Digital Display Indicator

(5) Digital Display Indicator. Manages the power supply (inverter) and allows setting each component for best and most efficient usage according to power needs. The digital display indicator is located on shelter interior front wall to the upper right of the air conditioner. Refer to Figure 1-23 for a view of shelter digital display indicator.

NOTE

AFATDS PCC is unit supplied.

(6) AFATDS Power Conditioner/Converter. AFATDS PCC continually conditions AC power supplied from power supply (inverter). When power supply (inverter) is not functional, the AFATDS PCC acts as backup to power supply (inverter). It converts DC power to AC, conditions the power, and supplies it to AC equipment in shelter as specified by outlet labels.

NOTE

All radio subsystem equipment is unit supplied with exception of KDUs.

c. Radio Subsystem. AFATDS radio components are located on radio rack and mounted to front roadside wall of the MTS. All shelves, with exception of bottom shelf, pull out for easy access.

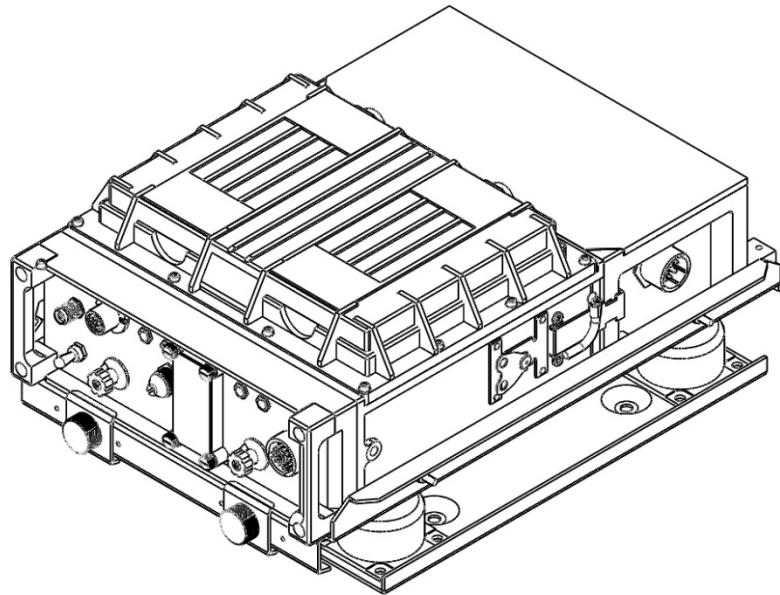


Figure 1-24. Enhanced Position Location and Reporting System Receiver/Transmitter

(1) Enhanced Position Location and Reporting System. Provides secure, jam-resistant digital communications and accurate position location capabilities. Radio set consists of a Receiver/Transmitter (R/T) and URO device. Refer to Figure 1-24 for a view of EPLRS R/T.

(a) Receiver/Transmitter. Transmits over-the-air message data, including data from host, and receives over-the-air message data and may send it to host.

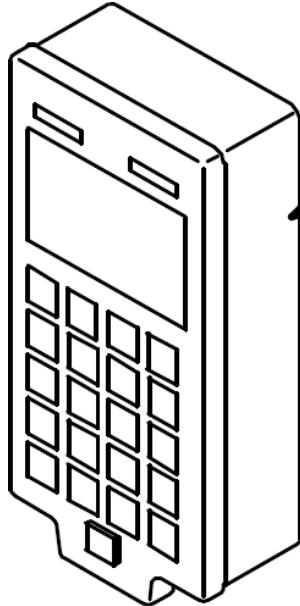


Figure 1-25. Enhanced Position Location and Reporting System User Read Out

(b) User Read-Out. The URO is an input and output device for EPLRS R/T. Allows user to input messages to be transmitted and displays received messages. Refer to Figure 1-25 for a view of EPLRS URO.

(2) AN/VRC-110. AN/VRC-110 radio system is comprised of two AN/PRC-152 radio handsets, two vehicle amplifier adapters, and a SINCGARS shock mount.

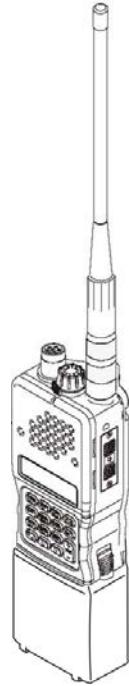


Figure 1-26. AN/PRC-152 Radio Handset

(a) AN/PRC-152 Radio. MTS is configured with two AN/PRC-152 tactical radios. This single-channel M-B, multi-mission radio covers the 30 MHz to 512 MHz frequency range with adjustable transmit output power. MTS configuration filters operating spectrum of radios on Very High Frequency (VHF) between 30 MHz to 88 MHz. Refer to Figure 1-26 for a view of the AN/PRC-152 radio handset.

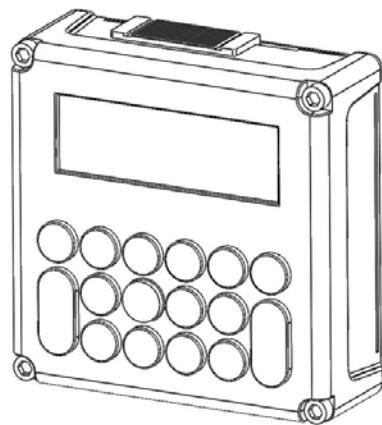


Figure 1-27. Keyboard Display Unit

(b) Keyboard Display Unit. The AN/VRC 110 radio uses a KDU to access radio information remotely. The KDU is connected to the cab mounted AN/VRC-110 radios and is mounted on roadside wall near personnel door.

d. Computer Subsystem. Shelter computer network components include an ADP interface unit, two unit-supplied AFATDS computers, four display units, two keyboards, and two mouse devices.

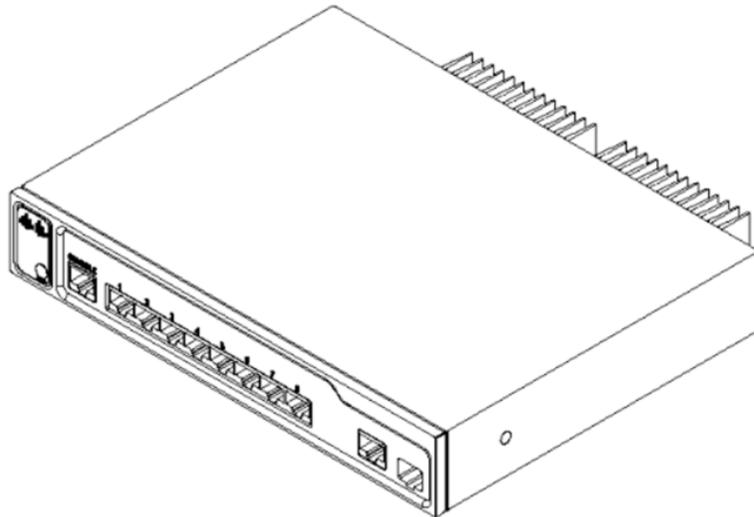


Figure 1-28. Automated Data Processing Interface Unit

(1) Automated Data Processing Interface Unit. Provides eight, 10/100 ports with Power-over-Ethernet (PoE), and one, dual-purpose 10/100/1000 and small form-factor pluggable port for maximum productivity. Identity-based networking services provide authentication, access control, and security policy administration to secure network connectivity and resources. Refer to Figure 1-28 for a view of the ADP interface unit.

NOTE

AFATDS computers are unit supplied.

(2) Advanced Field Artillery Tactical Data System Computers. The AFATDS Computer is an integrated fire support Command and Control (C2) system that allows for the planning, coordination, and execution of fire support assets.

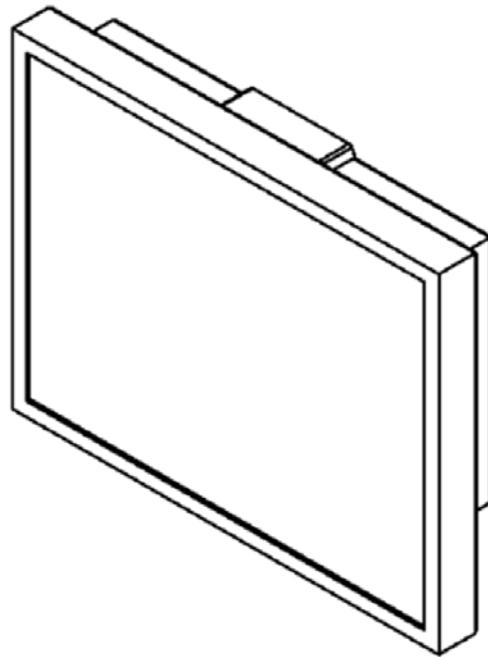


Figure 1-29. Display Unit

(3) Display Units. MTS incorporates four, 20-inch display units, two on interior curbside wall and two on interior curbside rear personnel door. Two display units connect to each AFATDS computer through a Radio Frequency (RF) power divider Video Graphics Array (VGA). Left display unit on curbside wall and top display unit on curbside rear personnel door display the same information. Right display unit on curbside wall and bottom display unit on curbside rear personnel door display the same information. Display units feature easy, on-screen menu adjustments and technology that automatically adjusts backlight to ambient brightness. Refer to Figure 1-29 for a view of the display unit.

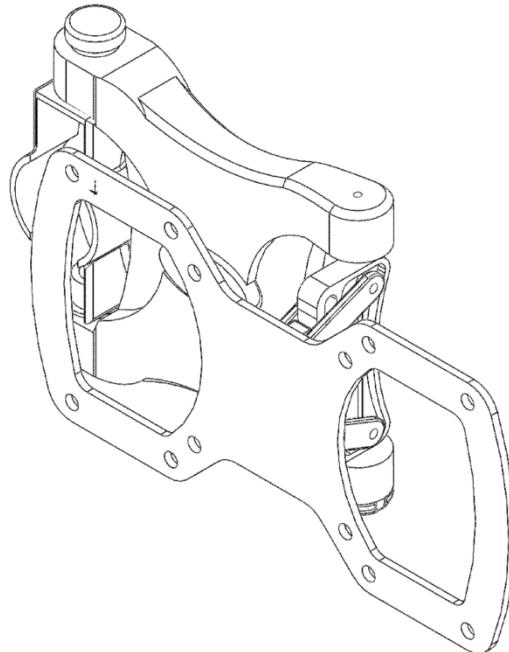


Figure 1-30. Mounting Bracket

(4) Mounting Bracket. Display units in shelter are mounted on shock-resistant brackets that secure them to the MTS while on the move. Brackets tilt vertically and horizontally to allow display units to be repositioned at optimum viewing angles for operator. Refer to Figure 1-30 for a view of the mounting bracket.

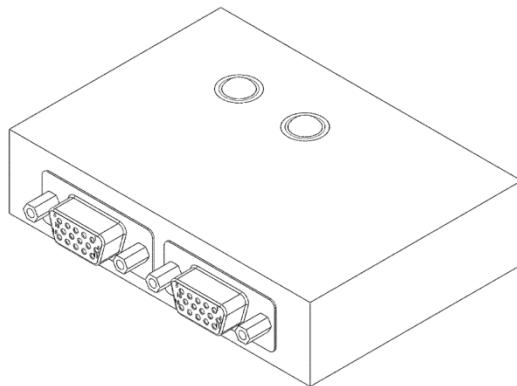


Figure 1-31. 2-Port Radio Frequency Power Divider

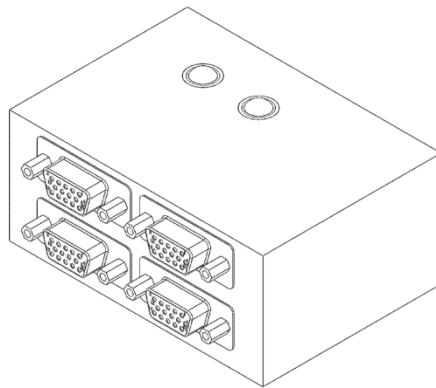


Figure 1-32. 4-Port Radio Frequency Power Divider

(5) Radio Frequency Power Divider. MTS includes two compact RF power dividers, one 2-port and one 4-port, that broadcast and boost VGA signal source from one AFATDS computer to two display units. Refer to Figure 1-31 and Figure 1-32 for views of the shelter RF power dividers.

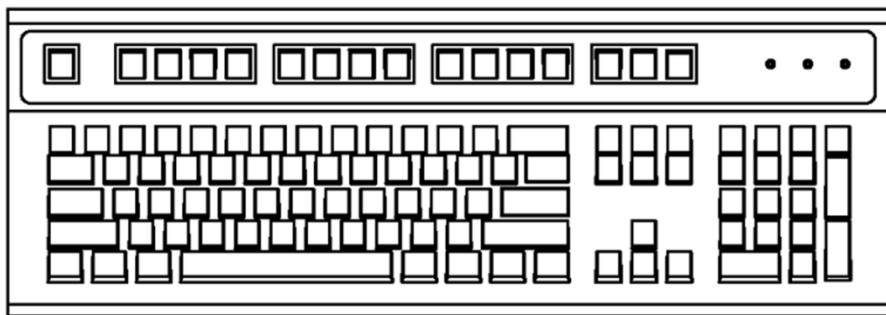


Figure 1-33. Keyboard and Mouse

(6) Keyboards and Mouse Devices. MTS uses two standard keyboards and two optical zoom mouse devices to operate user workstations. Keyboards feature user-selectable, zero-degree slope for wrist-posture improvement and a spill-drain feature to minimize damage from accidental fluid spill. A two-button optical mouse features a scroll wheel providing speed and accuracy of optical tracking. Both keyboard and mouse connect to standard Universal Serial Bus (USB) ports on curbside raceway. Refer to Figure 1-33 for a view of a typical shelter keyboard and mouse.

1-7. SPECIFICATIONS.

This section lists physical specifications of MTS systems and equipment. Refer to manufacturer documentation for specifications of COTS equipment.

Table 1-12. Shelter Specifications

Description	Specification w/o Unit Supplied Equipment	Specification with Unit Supplied Equipment (Mounted on M1152)
Weight	2200 lbs.	13,000 lbs.
Interior Height	64.5 inches	64.5 inches
Exterior	71 inches	105 inches
Width	98 inches	123 inches
Length	137 inches	208 inches
Operational Mode	-65 to 125° F (-54 to 52°C)	-65 to 125° F (-54 to 52°C)
Stowed Mode	-70 to 160° F (-57 to 71°C)	-70 to 160° F (-57 to 71°C)
Humidity	Ambient	Ambient

1-8. REFERENCE DATA.

The following documents were used in compiling this TM. The referenced documents are available on a supplemental disc provided with this system. Refer to Table 1-13.

NOTE

Reference documents with no PCN should be maintained at the unit or user level because this type of material is not loaded or maintained in the Marine Corps Technical Publications System.

Table 1-13. Reference Documents

Equipment	Publication Number	Description	PCN
Carbon Monoxide Alarm	PN 820-1305 Rev. C 10/07	Kidde Carbon Monoxide Alarm Users Manual	
Loudspeaker Control Unit	TB 11-5820-890-10-14	Operation of LS-671 Loudspeaker with SINCGARS Radio Sets, 1 April 1993	
Multiband Vehicular Antenna		RF-390 Multiband Vehicular Antenna Series Specifications, 2005	
Display Unit		NEC MultiSync® LCD2090UXi™/LCD2190UXi™ User's Manual	
Mounting Bracket		OmniMount 4N1-S Small VESA Wall-mount Instruction Manual, Version H	
Shelter Batteries		EnerSys™/Hawker™ 12-Volt MIL PC Line of Batteries for Defense Applications Specifications	
AFATDS Computers		Getac M230 User's Manual, May 2009	
EPLRS	TM 10901A-OR/1	Enhanced Position Location Reporting System Operator's Manual, Marine Corps, 15 December 2004	351 109011 00
	TM 10901A-OR/2	Operator's Manual, dated 1 March 1999	351 109011 00
Omni-Directional Antenna		AS-3449/VSQ-1 RAMI Antenna Data Sheet	

Table 1-13. Reference Documents (Continued)

Equipment	Publication Number	Description	PCN
Multi-band Handheld Radio	TM 11496A-OI/3	AN/PRC-152 Multiband Handheld Radio Operation Manual, Rev. E., December 2007	500 114963 00
Multi-band Vehicular Radio System	Publication No. 10515-0359-4200	RF-300M Multi-band Vehicular Radio System Installation and Maintenance Manual, December 2008	
AFATDS PCC	0029-CHS3-A016 TM-1KWPCC-001A	V2 1 KW Power Converter and Conditioner Hardware, April 2009	
HMMWV	TM 11033-OR	Operator's Manual for Truck, Utility: S250 Shelter Carrier, 4X4, M1152	184 110330 00
	TM 11033-IN Vol 1	Unit, Direct Support, and General Support Maintenance for Truck, Utility: S250 Shelter Carrier, 4X4, M1152	184 110331 00
	TM 11033-IN Vol 2	Unit, Direct Support, and General Support Maintenance Repair Parts and Special Tools List For Truck, Utility: Shelter Carrier, 4x4, M1152	184 110332 00
	TM 11033-INP	Unit, Direct Support, and General Support Maintenance Repair Parts and Special Tools List for Truck, Utility: S250 Shelter Carrier, 4X4, M1152	184 100333 00
	TB 9-2320-335-13&P	Technical Bulletin Operator and Field Maintenance and Repair Parts and Special Tools List Instructions	
Air Conditioner	TM 11453A/11453B-OI	Environmental Control Unit .75-Ton, 9,000 BTU/Hr Operation/Maintenance Manual with Repair Parts List, August 2010	500 114530 00
Shelter, Electrical Equipment Lightweight	TM 10-5411-235-13&P and Addendum	Operational, Unit, and Direct Support Maintenance Manual (including RPSTL) for LMS Type I and III, 15 August 2007	
Grounding Kit	TM 11-5820-1118-12&P	Operator's and Unit Maintenance Manual, MK-2551A/U, May 1994	
First Aid	MCRP 3-02G	Marine Corps Reference Publication (MCRP) First Aid, 23 Dec. 2002	144 000037 00
Power Supply (Inverter)		OutBack Power Systems™ FX Series Inverter/Charger Installation Manual, 2008	
		OutBack Power Systems™ Extreme Rugged Inverter/Charger Power Systems Installation and User Manual	
Digital Display Indicator		OutBack Mate Systems™ Controller and Display Installation and User Manual, 2007	
		OutBack Power Systems™ Mate Serial Communication Guide, 2007	
		OutBack Power Systems™ MATE2M System Controller and Display Installation and User Manual, 2003	

CHAPTER 2

SAFETY PRECAUTIONS

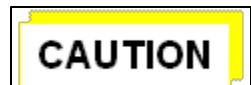
2-1. INTRODUCTION.

The following general precautions are recommended safety measures that do not relate to any specific procedure. Personnel must understand and apply these precautions during all phases of operation, test, and maintenance. Strict adherence to safety procedures in this chapter will prevent injury to personnel and damage to equipment. Specific **WARNINGS** and **CAUTIONS** appear throughout the text as they apply. Read all safety instructions prior to utilizing system.

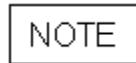
- a. **Purpose, Scope, and Organization of System Safety Instructions.** The purpose of this chapter is to provide safety information and precautions for installation, operation, and maintenance of Mobile Tactical Shelter (MTS) and equipment. This chapter provides safety precautions and instructions that must be followed during operation and maintenance to ensure personnel safety and health and protection of government property. This chapter discusses electromagnetic Radiation Hazards (RADHAZ), system hazards and precautions, operational and maintenance safety, and handling hazardous components.
- b. **Basic Safety Concept.** Individuals are responsible for their own safety and the safety of others working on or near equipment.
- c. **Basic Responsibilities for Safety.** Processes and procedures described in this Technical Manual (TM) require compliance with standard safety precautions. Users must adhere to procedures, recommendations, **WARNINGS**, and **CAUTIONS** provided to ensure safe use, handling, storage, and disposal of equipment.
- d. **Warnings, Cautions, and Notes.** **WARNINGS** and **CAUTIONS** highlight statements considered essential to protection of personnel or equipment. **WARNINGS** and **CAUTIONS** immediately precede procedure to which they apply. Notes highlight statements not essential to protection of personnel or equipment. Notes may precede or follow a step or procedure. Symbols used and their definitions are as follows:



HIGHLIGHTS AN ESSENTIAL OPERATING OR MAINTENANCE PROCEDURE, PRACTICE, CONDITION, STATEMENT, ETC. THAT COULD RESULT IN INJURY TO OR DEATH OF PERSONNEL OR LONG-TERM HEALTH HAZARDS IF NOT STRICTLY OBSERVED.



Highlights an essential operating or maintenance procedure, practice, condition, statement, etc., that could result in damage to or destruction of equipment or loss of mission effectiveness if not strictly observed.



Highlights an essential operating or maintenance procedure, condition, or statement.

2-2. SAFETY PRECAUTIONS.

Observe the following warnings and cautions at all times.



- DANGEROUS VOLTAGES EXIST IN SYSTEM EQUIPMENT. TO PREVENT PERSONNEL INJURY, DO NOT ATTEMPT REPAIRS WHEN POWER FROM POWER SOURCES AND/OR BATTERY BACKUP IS APPLIED. DISCONNECT ALL POWER WHEN REMOVING EQUIPMENT COVERS OR ACCESS PLATES.
- ENSURE VEHICLE GROUNDING STRAPS LOCATED ROADSIDE AND CURBSIDE BENEATH SHELTER ARE CONNECTED ANY TIME SHELTER IS IN USE. FAILURE TO CONNECT GROUNDING STRAPS COULD RESULT IN PERSONNEL INJURY OR DEATH.
- TO PREVENT PERSONNEL INJURY, USE CARE WHEN INSTALLING AND/OR REMOVING PERIPHERAL AND ASSOCIATED DEVICES. REMOVING EQUIPMENT COVERS AND ACCESS PLATES MAY EXPOSE SHARP EDGES.
- ENSURE WHEEL CHOCKS ARE PLACED BEHIND FRONT VEHICLE WHEELS ANY TIME VEHICLE IS STOPPED AND SHELTER IS IN USE. FAILURE TO DO SO COULD RESULT IN PERSONNEL INJURY OR DEATH FROM UNEXPECTED MOVEMENT OF VEHICLE.



- To prevent damage to equipment, always follow appropriate equipment shutdown procedures. If not followed, operational software can be corrupted and system may not reboot.
- System equipment contains Electrostatic Discharge (ESD)-sensitive circuit components. To prevent damage to equipment, use proper procedures in accordance with (IAW) MIL-STD-1686 when handling, removing, or replacing equipment to prevent ESD damage.
- To prevent equipment damage, do not attempt repairs when power from power sources and/or battery backup is applied. Disconnect all power when removing equipment covers or access plates.
- To prevent damage to equipment, remove exterior canvas covers and all items from the exterior rack prior to air conditioner operation.
- To prevent damage to equipment adhere to a 350 pound (lb) weight limit on the exterior shelf.

2-3. ELECTROMAGNETIC RADIATION HAZARDS AND PRECAUTIONS.

The maximum possible radiation that could be emitted from either the RF-390/VRC UHF/VHF or the AS-3440/VSQ-1 antenna would be at the tip of either antenna mast and while the power amplifier is radiating. Because of the length of the masts, and the Standard Operating Procedure (SOP) for any of the emplacement or displacement tasks not requiring operators to be on top of the shelter, the operational risk as a RADHAZ is minimal. The only tasks that a maintainer would perform that require access to and near the antenna structure would be in the install or remove and replace procedures. Only in the event that a maintainer neglected to turn off primary power at the PDU, and at the antenna circuit breaker switch while he/she is replacing or repairing the mast or mount could there be a safety hazard. Even then the power amplifier would need to be on and radiating for there to be a RADHAZ.

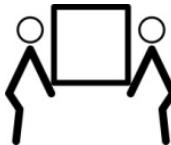
2-4. SYSTEM HAZARDS AND PRECAUTIONS.

- a. Safety Equipment. Safety equipment associated with MTS includes:

- One fire extinguisher.
- One carbon monoxide detector.

b. General Safety Precautions. The following general safety precautions are not unique to any specific procedures and therefore do not appear elsewhere in this TM. These are general recommended precautions that all personnel should know and understand. These precautions should be applied during all phases of operation and maintenance.

- (1) To prevent possible shock or death, ensure all power switches/Circuit Breakers (CBs) are set to the open position before connecting grounding strap to power entry panels.
- (2) Electrical currents sufficient to cause death or injury to personnel are present throughout MTS. All personnel must be aware of measures required to prevent and treat electrocution. Personnel working with or near high voltages should be familiar with emergency resuscitation methods. Marine Corps Reference Publication (MCRP) 3-02G is included with this manual. MCRP 3-02G provides the procedures for performing emergency resuscitation.
- (3) Never work on electronic equipment unless there is another person nearby who is familiar with operation and hazards of equipment and who is competent in administering first aid. All personnel must be warned about dangerous areas. Whenever possible, power supply to equipment must be shut off before beginning work on equipment. When working inside equipment after power has been turned off, always ground every part before touching.
- (4) High voltage is used in this equipment. Use care when working near Alternating Current (AC) or Direct Current (DC) power source. Observe warning notes in this TM and warning decals on equipment. Death on contact can result if safety precautions are not observed.
- (5) Do not replace components or make adjustments inside equipment with high voltage supply turned on. Dangerous potentials may exist even when power control is in the open (OFF) position due to charges retained by capacitors. To avoid casualties always remove power and ground circuit before touching.
- (6) Do not be misled by the term low voltage. Voltages as low as 50 Volts Alternating Current (VAC) can cause death under adverse conditions. Voltages as high as 56 VAC may be present at ends of signal cables. Use extreme care when connecting or disconnecting wires.
- (7) Voltages as high as 130 VAC may be present at AC power cable ends. Use extreme care when connecting or disconnecting cables. To prevent personnel injury or death, ensure power unit is off, switches/CBs are set to open (OFF) and air conditioner and MTS equipment have been properly grounded.
- (8) Ensure all system elements have been properly grounded before connecting AC power cables. Electrical defects in load lines or load equipment can cause death to personnel on contact with an ungrounded system.
- (9) If a CB does not stay in the closed (ON) position when closed, do not attempt to close CB repeatedly. Repeated unsuccessful attempts to close CB can create an overload situation hazardous to personnel and equipment. Instead, investigate cause of problem and correct situation before attempting to close CB again.

WARNING

ALWAYS OBSERVE PROPER LIFTING AND CARRYING WEIGHT LIMITS. REFER TO MIL-STD-1472 FOR MAXIMUM WEIGHT LIMITS.

- c. Lifting and Carrying Heavy Equipment. Two-person lift icons are used throughout this TM to signal a warning when required.
- d. Heat and Cold. Thermally insulated gloves must be worn whenever extremely hot or cold parts are handled.
- e. Electrostatic Discharge Items. Use the following precautionary procedures when touching, removing, or installing parts and ESD-sensitive assemblies:
 - Use wrist strap or manual grounding procedures.
 - Keep ESD items in protective covering when not in use.
 - Ground all electrical tools and test equipment.
 - Periodically check continuity and resistance of grounding systems.
 - Use only metallic solder suckers.
 - Handle ESD items only in protected areas.

2-5. OPERATIONAL AND MAINTENANCE SAFETY SUMMARY.

The following operational safety guidelines apply to all levels of shelter operation.

- a. General Operational Safety Guidelines. Prior to energizing system or any subsystem element, comply with all safety considerations listed below:

- Ensure all personnel are aware of possibility of electrical hazards.
- Verify fire extinguisher is properly charged and easily accessible.
- Ensure system start-up procedures are strictly followed.
- Ensure proper operation of the carbon monoxide detector.

NOTE

Field protective mask for chemical/biological/radiological protection will not protect users from carbon monoxide poisoning. The best defense against carbon monoxide poisoning is good ventilation.

- b. Carbon Monoxide Considerations. Carbon monoxide is colorless and odorless. Breathing air with carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, fatigue, coma, and death. Brain damage or death can result from prolonged exposure. Carbon monoxide occurs in exhaust fumes of fuel-burning heaters and internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of no air movement. Precautions must be followed to ensure crew safety when personal heater or main or auxiliary engine of any vehicle is operated for any purpose. Use the following guidelines:

- Do not operate gas-powered personal heater or engine in a closed area unless area has adequate ventilation.
- If generator is used for power source, ensure exhaust fumes are not vented into work area.
- Do not idle engine without ensuring shelter ventilation.

- Be alert at all times during vehicle operation for exhaust odors and exposure symptoms. If symptoms occur, immediately ventilate personnel compartments. If symptoms persist, remove affected crew to fresh air, keep warm, and seek first aid.

c. Precautions for Victims of Electric Shock. If someone becomes a victim of electrical shock, be aware of the following precautions:

- Do not try to pull or grab the individual as severe injury or death could result.
- If possible, turn off electrical power.
- If power cannot be turned off, use a dry wooden pole, dry rope, or other insulating material to push, pull, or lift person to safety.
- Send for help as soon as possible.
- After person is free of contact with source of electrical hazard, move person a short distance away and treat for shock.
- If person has stopped breathing or does not have a pulse, immediately start artificial resuscitation. Refer to Marine Corps Reference Publication (MCRP) 3-02G for detailed instructions on performing artificial resuscitation.

d. General Maintenance Safety Guidelines. The following guidelines apply to all levels of general maintenance on MTS:

- Allow only qualified maintenance personnel to perform corrective maintenance actions on electronic equipment.
- Ensure at least two people are present during corrective maintenance actions on electronic equipment.
- Ensure all internal and external grounds are properly connected before energizing equipment.
- Do not wear loose clothing, rings, wrist watches, or any other conductive material.
- Contact of metal objects with battery terminals can cause severe burns. Remove all jewelry and metal objects before replacing batteries.

e. Hand Tool and Test Equipment Safety Guidelines. The following personnel guidelines apply specifically to use of hand tools and test equipment and to all levels of shelter maintenance:

- Use tools with insulated handles, grips, or bodies when working on electronic equipment.
- Use only AC grounding type, three-prong test equipment or extension cords.
- Use tools and equipment as they were designed. Do not use tools to pry or move equipment if they were not designed for that purpose. Doing so could cause injury to personnel or to damage equipment.

f. Cleaning Agent Safety Guidelines. The following guidelines apply to the use of cleaning agents for all levels of general maintenance on shelter:

- There are no ozone depleting substances (cleaning solvents) recommended for use during maintenance of any shelter equipment. Cleaning solvents, fuels, oil, adhesives, and catalysts must be used in well-ventilated areas. Vapor concentrations and skin contact can be harmful. Death may result if vapors are inhaled for lengthy periods. Protective glasses should be worn and skin contact avoided. Body surfaces that contact fluids must be washed in hot water. Eyes must be rinsed with water and examined by a doctor.

- Compressed air is dangerous and can cause serious bodily harm if protective methods are not observed to prevent a chip or particle from being blown into eyes or unbroken skin of operator or other personnel. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 pounds per square inch and then only with effective chip guarding and personal protective equipment (i.e., industrial safety glasses and full face shield).

g. Vehicle Operating Restrictions (VOR).

The following vehicle operating restrictions, in accordance with Appendix F, shall be observed in order to ensure personnel safety, survivability and maintain equipment performance for the integrated AFATDS MTS system. These restrictions apply to the integrated AFATDS MTS on an armored M1152A1 with B2 kit and FRAG 5 only, configured with or without a trailer.

- The integrated HMMWV speed should not exceed 40 miles per hour (mph) over primary road surfaces, 35 mph over secondary surfaces and 20 mph over any off-road cross country surfaces, the standard armored Expanded Capacity Vehicle (ECV) speeds on terrain are 45/35/20 mph.
- The integrated HMMWV should not operate or be parked on grades greater than 30%.
- The integrated HMMWV should not operate on side slopes greater than 30%, the standard armored HMMWV ECV side slope specification.
- Braking distances are increased on all terrain types due to overweight front axle and GVW conditions. Operators should maintain greater following distances and begin to stop vehicle earlier than normal to maintain safety.
- Users should increase all inspections and preventative maintenance checks of the HMMWV due to overweight front axle. Frequency of checks will be based on the AFATDS MTS fielding requirement and will be heavily influenced by system usage.

2-6. HAZARDOUS COMPONENTS.

Hazardous components are those components with significant hazards that require further explanation or that remain classified as potentially critical or catastrophic in severity.



REPEATED AND/OR PROLONGED EXPOSURE MAY CAUSE DEFATTING OF SKIN WITH ITCHING, REDNESS, OR RASH. CONTACT WITH VAPOR OR AEROSOL MAY CAUSE EYE IRRITATION WITH TEARING, PAIN, OR BLURRED VISION. INCREASED SUSCEPTIBILITY TO EFFECTS OF THIS MATERIAL MAY BE OBSERVED IN PERSONS WITH PRE-EXISTING DISEASE OF CENTRAL NERVOUS SYSTEM AND CARDIOVASCULAR SYSTEM.

a. Polyvinyl Chloride. Shelter contains a number of Polyvinyl Chloride (PVC) insulated cables and wires. PVC is preferred material used by wiring manufacturers. Thermal decomposition products of PVC can include carcinogens such as ethylene, benzene, toluene, and poisons including hydrogen chloride gas, carbon monoxide, and phosgene gas. Small quantities of hydrogen chloride gas and phosgene gas can incapacitate a person. In case of fire, personnel should evacuate unless a protective air breathing apparatus is in use.



REPEATED AND/OR PROLONGED EXPOSURE MAY CAUSE DEFATTING OF SKIN WITH ITCHING, REDNESS, OR RASH. CONTACT WITH VAPOR OR AEROSOL MAY CAUSE EYE IRRITATION WITH TEARING, PAIN, OR BLURRED VISION. INCREASED SUSCEPTIBILITY TO EFFECTS OF THIS MATERIAL MAY BE OBSERVED IN PERSONS WITH PRE-EXISTING DISEASE OF CENTRAL NERVOUS SYSTEM AND CARDIOVASCULAR SYSTEM.

b. Refrigerant. Air conditioner attached to exterior of shelter may contain R22 (HCFC-22) refrigerant. There is a possibility of R22 (Hydro chlorofluorocarbon (HCFC) -22) vapors escaping from unit. Inhalation of high concentrations of this vapor is harmful and may cause heart irregularities, unconsciousness, or death. Intentional or unintentional misuse or deliberate or inadvertent inhalation can be fatal. Vapors are heavier than air and pose a threat of suffocation if trapped in enclosed or low places.

Immediate effects of overexposure by inhalation may include central nervous system depression with dizziness, confusion, loss of coordination, or drowsiness. Gross overexposure may cause irregular heartbeat, heart palpitations, apprehension, lightheadedness, feeling of fainting, weakness sometimes progressing to loss of consciousness, and death. Short-term overexposure by skin contact may cause frostbite if liquid or escaping vapor contacts skin.

With the phase-out of R-22, R-407C has emerged as the preferred working fluid for the majority of cooling applications. R-407C, while similar to R-22 in many of its physical properties, is a zeotropic mixture of HFCs which does impose certain application restrictions and specific handling and equipment design requirements.



REPEATED AND/OR PROLONGED EXPOSURE MAY CAUSE PERMANENT IMPARED VISION OR BLINDNESS. TO AVOID INJURY TO PERSONNEL, AVOID LOOKING DIRECTLY INTO PATH OF LASER BEAM.

c. Lasers. Shelter contains equipment that uses lasers and fiber-optic cables. Do not examine, look directly at, or stare into broken, severed, or disconnected fiber-optic cables. A laser-warning label is affixed to outside of device package where dangerous optical energy may be transmitted.

Compact Disc (CD) drives used in shelter use laser diode sources with sufficient energy to cause permanent eye damage. Diodes are completely encased within drive housing. Manufacturers of CD drives attach a laser-warning label to outside of device package.

- (1) Class 1 Laser. A Class 1 laser is safe under all conditions of normal use, which means Maximum Permissible Exposure (MPE) cannot be exceeded. This class includes high-power lasers within an enclosure that prevents exposure to radiation and that cannot be opened without shutting down laser.
- (2) Class 3b Laser. A Class 3b laser is hazardous if eye is directly exposed, but diffuses reflections such as from paper or other matte surfaces are not harmful.

CHAPTER 3

INSTALLATION

3-1. INTRODUCTION.

This chapter details procedures for installing components to bring shelter from non-operational or stowed mode to operational mode.

NOTE

The Mobile Tactical Shelter (MTS) is mounted on a High Mobility Multipurpose Wheeled Vehicle (HMMWV), and houses the Advanced Field Artillery Tactical Data System (AFATDS) and communications equipment components in order to conduct fire support operations. All systems inside the shelter are powered by two batteries accessed through the battery door on the curbside exterior wall of shelter.

3-2. SITE SELECTION.

Shelter operating site is determined by terrain, system planning, and security requirements. General site layout should be free from natural and man-made obstructions. Use the following criteria to select ground site:

- Ensure the HMMWV is not on an incline greater than 30 degrees from side to side to prevent possible rollover.
- Ensure that there are no overhead or underground hazards or other obstructions.
- Ensure terrain is free from water and provides adequate drainage.
- Avoid areas that might contain power cables or cabling systems.
- Check for overhead power lines prior to installing the antenna mast.

3-3. SYSTEM GROUNDING.

System grounding is essential for proper operation as well as for personnel and equipment safety. Refer to TM 11-5820-1118-12&P.

3-4. INSTALLING SHELTER SYSTEMS.

Shelter is shipped and preinstalled with power system, Keypad Display Units (KDUs), radio mount, Automatic Data Processing (ADP) interface unit, antenna mounts, display units, and an air conditioner. In the event any of these system components must be removed for maintenance, repair, or replacement, refer to Chapter 6 for maintenance procedures and Chapter 7 for Lowest Replaceable Unit (LRU) repair and replacement instructions.

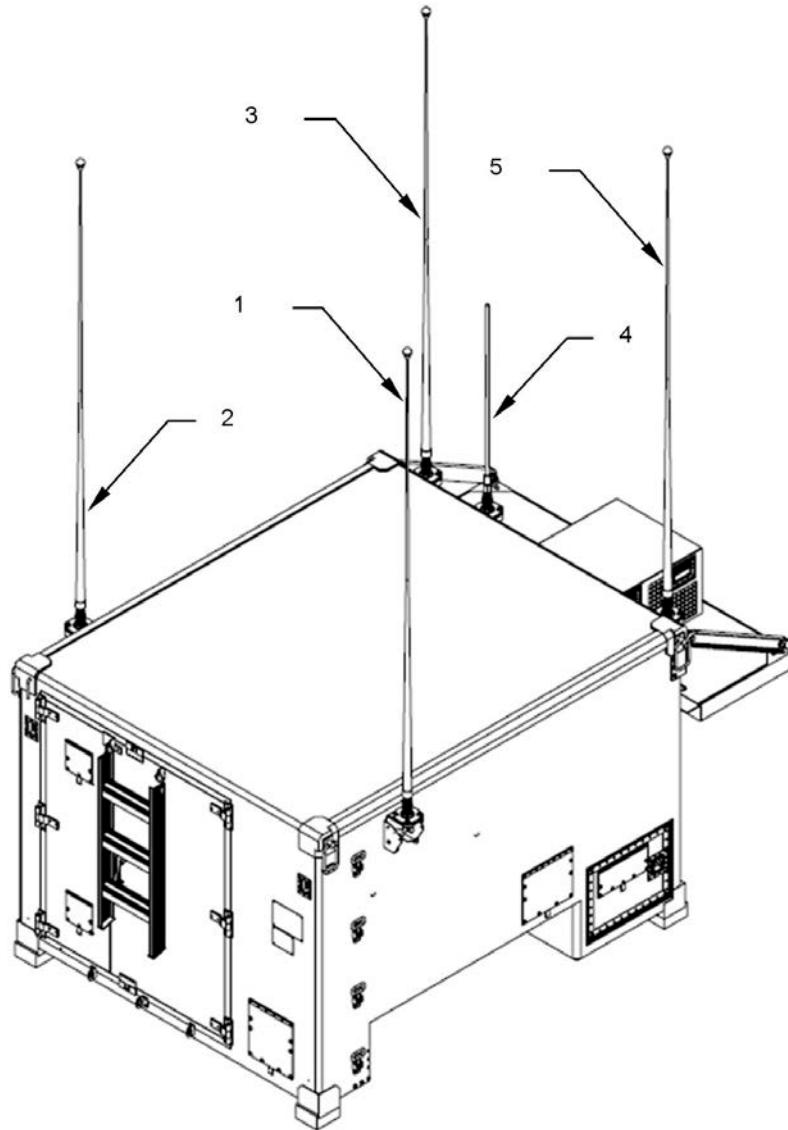
a. Shelter Subsystem

Figure 3-1. Shelter Antenna Locations

Table 3-1. Shelter Antenna Descriptions

Item No.	Description
1	RF-390A/VRC Multi-band (M-B) antenna, rear curbside
2	RF-390A/VRC M-B antenna, rear roadside
3	RF-390A/VRC M-B antenna, front roadside
4	AS-3449/VSQ-1 Omni-directional antenna, front center
5	RF-390A/VRC M-B antenna, front curbside

(1) Antennas. There are four RF-390A/VRC Multi-band (M-B) antennas and one AS-3449/VSQ-1 Omni-directional antenna located on shelter. Refer to Figure 3-1 and for location of shelter antennas.

NOTE

RF-390A/VRC M-B antennas and AS-3449/VSQ-1 Omni-directional antenna are not interchangeable. Antennas can only be installed on their respective brackets. RF-390A/VRC M-B antennas can be installed on any RF-390A/VRC M-B antenna bracket.

**Figure 3-2. RF-390A/VRC Multi-band Antenna**

(a) RF-390A/VRC M-B Antenna. Refer to Figure 3-1 for antenna locations. Refer to Figure 3-2 for RF-390A/VRC M-B antenna.

CAUTION

Mast can easily be cross threaded if correct procedures are not followed.

NOTE

Do not remove end caps at this time.

1 Separate the antenna mast at middle joint prior to installing on base. The shorter overall length makes for an easier thread alignment between antenna and base.

2 Mount bottom section of antenna mast to pre-installed antenna base by screwing antenna mast to antenna base in the following locations:

- Curbside front wall
- Roadside front wall
- Curbside wall
- Roadside wall

CAUTION

Do not over-tighten. Over-tightening can damage antenna connector and/or mount.

3 Thread onto base by spinning clockwise.

4 Tighten antenna to hand-tight.

5 Once bottom section of mast is firmly seated on base, attach the top section by threading on clockwise.

NOTE

End cap should remain installed while in transit.

6 Remove end caps and attach BNC connector to W4-1 (qty 2) and W4-3 (qty 2).

7 Connect W4-1 and W4-3 to antenna base and RF pass-through panel.



Figure 3-3. AS-3449/VSQ-1 Omni-directional Antenna

(b) AS-3449/VSQ-1 Omni-directional Antenna. Refer to Figure 3-1 for antenna locations. Refer to Figure 3-3 for the Omni-directional antenna.

1 Mount antenna mast to antenna mounting bracket on front shelter wall by screwing antenna mast to antenna base.



Do not over-tighten. Over-tightening could damage antenna connector and/or mount.



End cap should remain installed while in transit.

2 Remove end cap and attach "N" type connector (W5).

3 Connect W4-1 and W4-3 to antenna base and RF pass-through panel.

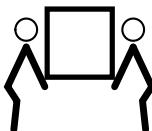
NOTE

AFATDS Power Conditioner/Converter (PCC) is unit supplied.

(2) Power Conditioner/Converter. Install AFATDS PCC on bottom shelf of radio rack using the following procedure:

- (a) Position AFATDS PCC on tray and slide it into place.
- (b) Connect grounding wire (W246) to AFATDS PCC and use supplied wing nuts to tighten securely in place.
- (c) Connect W228 to AC OUT, W229 to DC IN, and W227 to AC IN.
- (d) Secure with retention strap.

WARNING



THE BATTERY IS A TWO-MAN LIFT. THE BATTERY IS DIFFICULT TO PICK UP AND MOVE. ENSURE THAT YOU HAVE GOOD FOOTING AND A CLEAR PATH TO BATTERY COMPARTMENT. INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION

- To prevent damage to equipment, perform the procedures below to close and open the battery compartment door.
- Prior to closing the battery compartment door, ensure the latch pawl, on the inside of the door, is in the 12 o'clock position and door is fully seated to its frame by applying mild pressure to door with free hand.

(3) Battery Compartment Door. Perform the following procedures to close and open the battery compartment door.

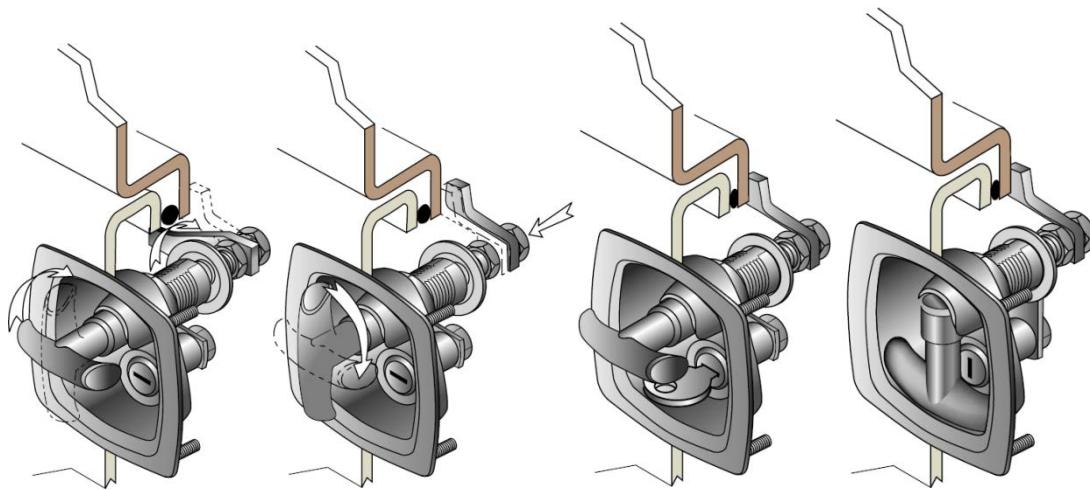


Figure 3-4. Closing Battery Compartment Door

NOTE

MTS does not use lock and key.

(4) As shown in Figure 3-4, when closing the doors perform the following steps:

- (a) Rotate T-handle clockwise to closed position.
- (b) Continue turning T-handle to apply compression.
- (c) Fold T-handle down into recessed position.

(5) When opening the door, perform the reverse process as indicated in Figure 3-4:

- (a) Rotate T-handle counter-clockwise to open position.
- (b) Continue turning T-handle to release compression.
- (c) T-handle remains in operable position.

(6) Batteries. To install the batteries, perform the following steps:

- (a) Remove plastic protection caps from battery posts.

NOTE

Ensure that the positive (+) battery posts are positioned toward roadside.

- (b) Loosen straps on battery tray and move to one side so as not to interfere with battery installation.
- (c) Lift battery and position on the battery tray.
- (d) Position strap over battery and adjust tension on battery strap using strap ratchet.
- (e) Repeat steps (a) through (d) for second battery.

(7) Battery cables. To connect the battery cables to the Power Distribution Unit (PDU) perform the following steps:

- (a) Connect CB1 LINE (red) from PDU to the POSITIVE (+) post on Battery #1.
- (b) Connect jumper cable to the batteries as follows:
 - 1 W219 P1 (labeled BT1 -) to NEGATIVE (-) post on Battery #1.
 - 2 W219 P2 (labeled BT 2 +) to POSITIVE (+) post on Battery #2.
- (c) Connect W220 P1 (labeled BT2 -) to NEGATIVE (-) post on Battery #2.
- (d) Tighten cable connections using a 1/2 inch wrench.

b. Radio Subsystem

NOTE

- All radio subsystems except KDUs and Automated Data Processing (ADP) interface unit are unit supplied.
- Shelves one through five slide for easy access of EPLRS, SINCGARS, ADP interface unit, and AFATDS computers; shelf six containing the PCC is fixed.

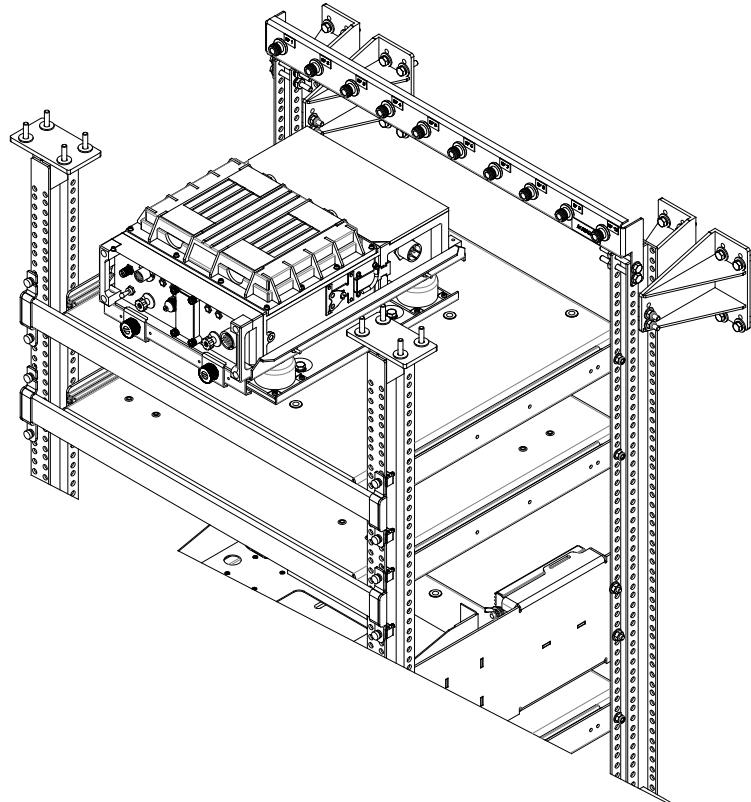


Figure 3-5. Enhanced Position Location and Reporting System

(1) Enhanced Position Location and Reporting System. Enhanced Position Location and Reporting System (EPLRS) radio mount is installed on top shelf of radio rack. Refer to Figure 3-5 while performing this procedure.

- (a) Mount power block onto EPLRS Receiver/Transmitter (R/T).
- (b) Install EPLRS R/T into mount located on top shelf of radio rack.
- (c) Lock R/T into mount by tightening clamp located on front of mounting base.
- (d) Attach W1-3 to J2 of EPLRS radio.
- (e) Attach unit-supplied cable PN 80063-A3109227 to J3.
- (f) Reconnect ground wire (W217-4).
- (g) Connect unit-supplied cable (PN 80063-A3109227) from User Read Out (URO) to EPLRS mounting base.

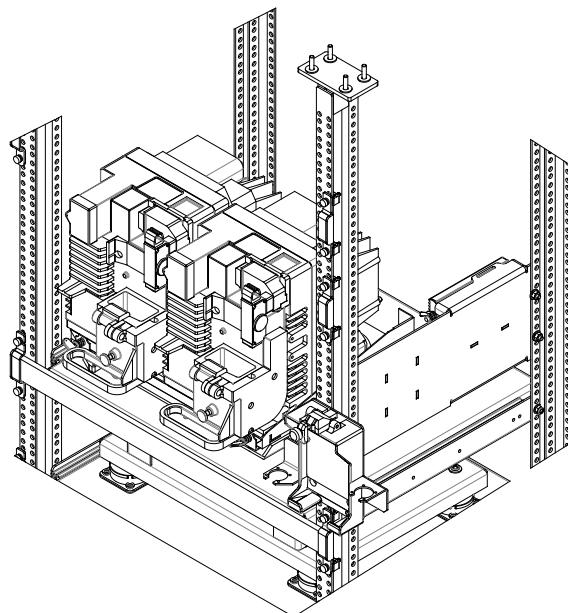


Figure 3-6. AN/VRC-110

(2) AN/VRC-110. AN/VRC-110 radio systems includes two AN/PRC-152 radio handsets, Vehicle Adapter Unit (VAU), two VAAs, and a shock mount. AN/VRC-110 radio system is installed on third shelf of radio rack. Refer to Figure 3-6 to install the radio system.

- (a) Install shock mount interface assembly.
- (b) Install and connect W65 cable (P1 to AC/DC power raceway, P2 to shock mount interface assembly).
- (c) Install two VAAs onto shock mount assembly. Lock in place with thumb screws on front of shock mount.

- (d) Connect ground straps (W217-3 from mount to back of VAA) and secure with supplied screw.
- (e) Connect RF 1/2 LOW to J3 Very High Frequency (VHF) connector and RF 1/2 HI to J4 Ultra High Frequency (UHF) connector of the VAA.

NOTE

If AN/PRC-152 is not properly seated, fault warning light will illuminate.

- (f) Install AN/PRC-152 radio in VAA. Ensure that it is locked in place.
- (g) Attach VAA data block into AN/PRC-152.
- (h) Using the unit-supplied, 6-inch jumper (PN 12053-1420-A2 and PN 12049-0500-01) connect AN/PRC-152 to VAA J5.
- (i) Connect AN/PRC-152 handsets to Speakers #1(W222-1) and #2 (W222-2), located by rear door of MTS.

c. Advanced Field Artillery Tactical Data System Computer Subsystem

CAUTION

- To avoid possible damage to adapter or computer when disconnecting AC adapter, disconnect from electrical outlet first and then from computer. When unplugging connector, always hold plug head to avoid possible damage to adapter or computer. Never pull on cord.
- To prevent damage to equipment, do not pull out shelves four and five simultaneously.

- (1) AFATDS Computers. The AFATDS Computer is an integrated fire support Command and Control (C2) system that allows for the planning, coordination, and execution of fire support assets.

NOTE

AFATDS computers are unit supplied.

- (a) Ensure computer is powered OFF.
- (b) Unlock brackets on front of shock mount.
- (c) Lift the shock mount cover and place the computer in the shock mount.
- (d) Stow AFATDS computer power converter in power supply bracket on side of radio rack AN/VRC 110 shelf.
- (e) Connect grounding cable to GETAC computer (Note: most GETACs will require the grounding bolt to be changed from the right side of the computer to the left side).
- (f) Connect Alternating Current (AC) power adapter to computer's power connector.
- (g) Connect AC power adapter to PCC outlet on raceway.

NOTE

When AC adapter is connected, it also charges battery pack.

(h) Connect single USB 1 and USB 2 (W83-1 and W83-2) cables from USB 1 and USB 2 ports of computer on shelf four. Connect USB 3 and USB 4 cables (W83-3 and W83-4) from USB 3 and USB 4 to network hub adjacent to shelf three and connect W95 to computer on shelf four.

(i) Connect RF power divider Video Graphics Accelerator (VGA) cable (W81-2 for computer on shelf four and W81-1 for computer on shelf five) to computer.

(j) Connect Ethernet cables from the ADP IU ports 7 and 8 to GETAC computers in shelves 4 and 5. Cable W7-9 connects to computer on shelf four to Port 7, and cable W7-10 connects computer on shelf five to Port 8.

(k) Install communications modem (TacLink) into computer.

(l) Connect data cable from radio to the AFATDS TacLink.

(m) Power on the computer.

(n) Lock the brackets to secure the computer cover.

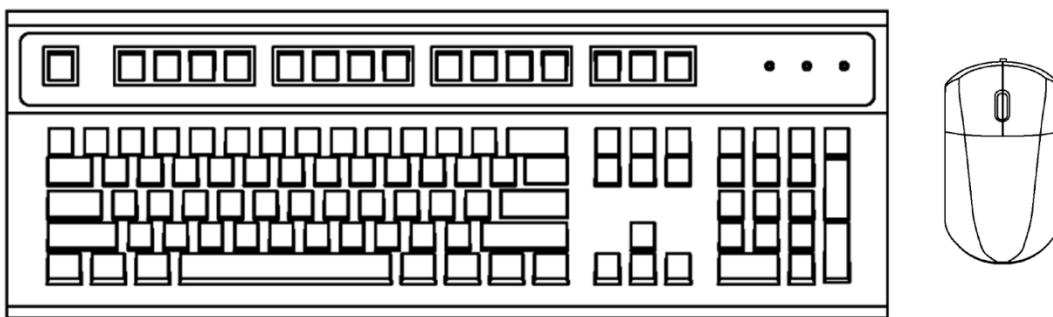


Figure 3-7. Keyboard and Mouse

(2) Keyboard and Mouse. Each AFATDS computer is operated with a standard keyboard and mouse. These devices connect to USB ports in raceways next to each monitor at user workstations. Refer to Figure 3-7 for a view of typical keyboard and mouse.

(a) Remove keyboards from brackets on overhead cabinet doors and place on desktop in front of each curbside display unit.

(b) Remove mouse devices from storage on side of lower cabinet and place in front of each curbside display unit.

(c) Connect keyboard and mouse cables (USB 1, USB 2, USB 3 and USB 4) to operator optional USB ports on curbside wall of shelter.

(3) AFATDS Printer

NOTE

AFATDS printer is unit supplied.

(a) Install AFATDS printer on curbside shelf and secure with straps.

- (b) Connect power cable (unit supplied) and network (W7-11) cable.

3-5. MTS OPERATIONAL STATE.

Follow the steps below to bring MTS to fully operational state.



- **ENSURE VEHICLE GROUNDING STRAPS LOCATED ROADSIDE AND CURBSIDE BENEATH SHELTER ARE CONNECTED ANY TIME SHELTER IS IN USE. FAILURE TO CONNECT GROUNDING STRAPS COULD RESULT IN PERSONNEL INJURY OR DEATH.**
- **TO PREVENT PERSONNEL INJURY OR DEATH, ENSURE ALL CIRCUIT BREAKERS ARE OPEN (OFF) PRIOR TO CONNECTING MTS BATTERY CABLES.**

NOTE

- These procedures assume shelter has been mounted on HMMWV.
- Vehicle Interface Panel (VIP) is located beneath battery compartment on curbside of shelter.

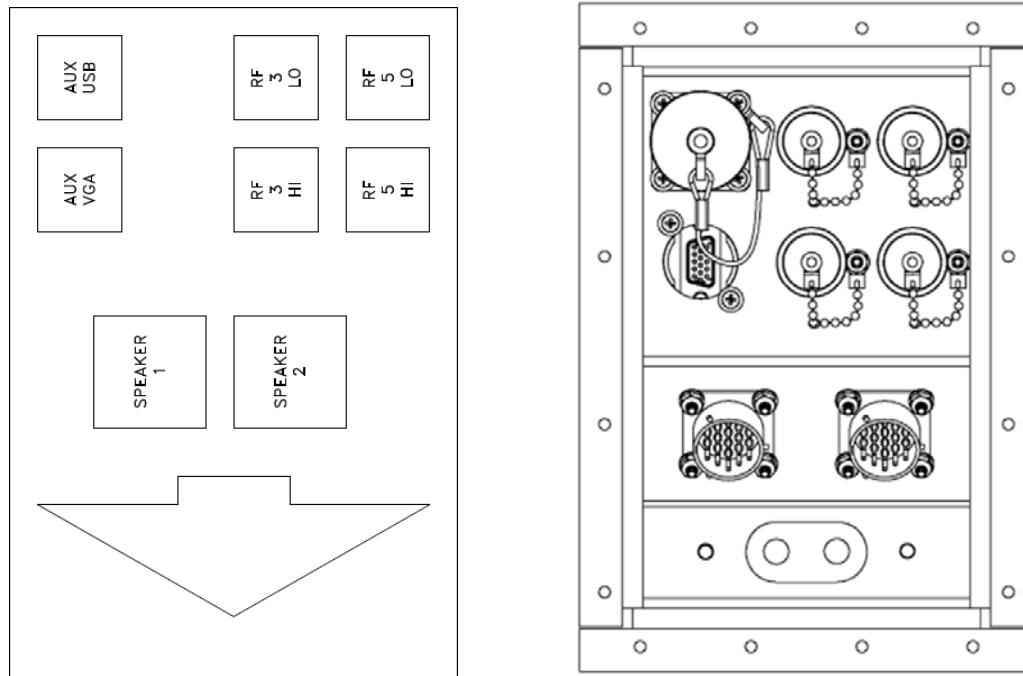


Figure 3-8. Vehicle Interface Panel Diagram and Vehicle Interface Panel

- a. Refer to Figure 3-8 for validation of cables from VIP to vehicle cab.
 - Four RF cables (RF 3 Hi, RF 3 Lo, RF 5 Hi, RF 5 Lo)
 - Two KDU cables.
 - Two speaker cables (Speaker #1 W224-1 and Speaker #2 W224-2)



To prevent damage to equipment, remove all stowage from the air conditioner shelf before powering on the air conditioner.

- b. Roll up and secure air conditioner cover. Remove all stowage from the air conditioner shelf.
- c. Close Circuit Breaker (CB) 1 to apply onboard AC power to shelter systems.
- d. Refer to Chapter 5 for instructions on powering on individual systems.

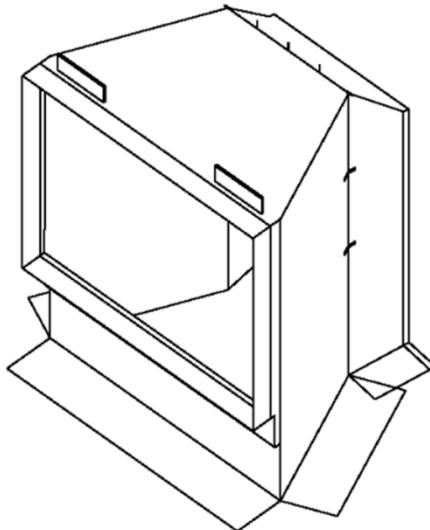


Figure 3-9. Vehicle Boot



If primary and secondary door brace assemblies are released to extend doors fully, ensure cable assemblies at RF 1 and 2 are not crimped or pinched between the exterior door and shelter surfaces.

- e. Install boot on rear of MTS to permit MTS mounting to soft shelter structure. Refer to Figure 3-9 for vehicle boot.
 - (1) Center the boot approximately four feet away from rear of shelter.
 - (2) Determine vehicle connection end by the antenna slots closest to edge. This end is to be placed on vehicle with slots at each corner of vehicle.
 - (3) After attaching the boot completely around the vehicle, use the bungee cord to tighten.

(4) Locate center label on opposite end and use hook-and-loop tape to attach boot to shelter door. Start in center and continue around door, sealing both top and bottom of flange.

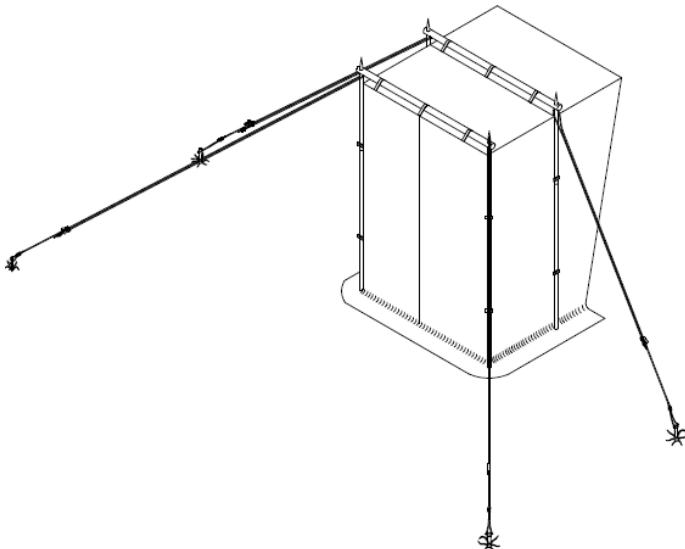


Figure 3-10. Vehicle Boot with Ridge Poles

(5) Insert two telescoping poles into sides and grommets. Insert ridge pole across center to lift material up and allow use of shelter door. Refer to Figure 3-10 for pole assembly.

(6) Attach floor to tent.



Ensure wall fabric on shelter has been staked down before pulling vehicle away or boot will not fit properly.

(7) Pull vehicle away to desired location.

(8) Use ropes to pull out telescoping poles and stake poles down into proper location.

(9) Install liner seal between liner and outer door. Attach hook-and-loop tape on back of doors to attach seal.

f. Remove ladder from storage bracket and hook to rear of MTS.

g. Roll up vent fan covers on battery compartment door and shelter personnel door.

h. Roll up display unit covers and secure with loop. Disconnect display unit strap.

3-6. EMERGENCY POWERING DOWN. Follow the steps below to remove power from all shelter systems in an emergency situation.

- a. Open CB-1, CB-2, CB-3, CB-12, and CB-19.
- b. Turn off and remove external power source.
- c. Remove negative battery cable from battery #2 (W220).

3-7. STOWED MODE. Follow the steps below to remove power from all systems and secure system from operations to stowed mode.

a. Powering Down the System

- (1) Refer to Chapter 5 of this manual for complete instructions on powering down individual systems.
- (2) Confirm that breakers CB-1, CB-2, CB-3, CB-12, and CB-19 are in the open position.
- (3) Turn off and then remove external power source connected to W201 J1 at power entry panel.

b. Securing the Display Units and Cooling Fans

- (1) Connect tie down straps to secure all display units.
- (2) Unroll display unit covers on rear door and secure with hook and loop strapping.
- (3) Unroll cooling fan covers on battery compartment door and shelter personnel door and secure with magnetic seal.

c. Securing Shelter Ladder and Boot

- (1) Remove shelter ladder from the rear of MTS and mount on ladder storage bracket on rear curbside personnel door.
- (2) Remove boot from rear of shelter and store. Perform the following procedures:
 - (a) Remove liner seal between liner and outer door.
 - (b) Remove staked down telescoping poles.
 - (c) Detach floor from tent.
 - (d) Remove two telescoping poles from sides and grommets. Remove ridge pole across center.
 - (e) Disconnect hook-and-loop tape from shelter door and unseal both top and bottom of flange.
 - (f) Loosen bungee cord and detach boot from shelter.

d. Secure the Air Conditioner. Unroll the air conditioner cover and secure.

e. Enhanced Position Location and Reporting System. EPLRS radio mount is installed on top shelf of radio rack. Refer to Figure 3-5 while performing this procedure.

- (1) Ensure Receiver/Transmitter (R/T) power knob is in the OFF position.
- (2) Remove unit-supplied URO cable (PN 80063-A3109227) from the shock mount.
- (3) Remove LAN cable (W1-3) from the EPLRS.
- (4) Remove grounding wire.
- (5) Remove the power cables (W262-5 and W262-6) from the EPLRS.
- (6) Unlock R/T from mount by loosening clamp located on front of mounting base.
- (7) Remove EPLRS R/T from mount located on top shelf of radio rack.

TM 11862A-OR

f. AN/VRC-110 Radio System. To remove the radio system, perform the following steps:

- (1) Disconnect AN/PRC-152 handsets from Speakers #1(W222-1) and #2 (W222-2), located by rear door of MTS.
- (2) Power off the VAA power amplifier and the AN/PRC-152 radio.
- (3) Disconnect 6-inch jumper (PN 12053-1420-A2 and PN 12049-0500-01) from AN/PRC-152 to VAA J5.
- (4) Remove VAA data block from AN/PRC-152.
- (5) Remove AN/PRC-152 radio from VAA.
- (6) Disconnect ground straps (W217-3) from shock mount to back of VAA.
- (7) Disconnect RF 1/2 LOW from J3 (VHF) connector and RF 1/2 HI from J4 (UHF) connector of the VAA.
- (8) Remove two VAAs from shock mount assembly.
- (9) Remove W65 cable (P1 from AC/DC power raceway, P2 from shock mount interface assembly).
- (10) Remove ground from shock mount assembly
- (11) Remove shock mount interface assembly.
- (12) Retain all items and place in storage.

g. Secure Antenna Components

Using a counter-clockwise motion, unscrew all antenna elements from MTS and reinstall antenna caps.

h. AFATDS Keyboard, Mouse, and Printer

- (1) Disconnect keyboard and mouse from USB ports on curbside wall of shelter.
- (2) Store keyboards in brackets mounted on upper curbside cabinet doors.
- (3) Store mouse devices in the brackets located on side of lower cabinet.
- (4) Disconnect power and network cables (W7-11) from the AFATDS printer.

i. AFATDS Computer #1

- (1) Slide out shelf four.
- (2) Disconnect W7-9 Ethernet cable.
- (3) Disconnect VGA cable (W81-2).
- (4) Disconnect USB cables.
- (5) Disconnect data cable.
- (6) Disconnect grounding strap
- (7) Disconnect power cable and store cable and power adapter in bracket on side of VAA shelf.

- (8) Unlock brackets on the shock mount, lift computer cover and remove computer from bracket.
- (9) Close the cover and relock the brackets on the shock mount.
- (10) Slide in shelf four.

j. AFATDS Computer #2

- (1) Slide out shelf five.
- (2) Disconnect W7-10 Ethernet cable.
- (3) Disconnect VGA cable (W81-1).
- (4) Disconnect USB cables.
- (5) Disconnect data cable
- (6) Disconnect grounding strap
- (7) Disconnect power cable and store cable and power adapter in bracket on side of VAA shelf Unlock brackets on the shock mount.
- (8) Lift computer cover and remove computer from bracket.
- (9) Close the cover and relock the brackets on the shock mount.
- (10) Slide in shelf five.

k. Power Conditioner/Converter.

- (1) Loosen the retention strap.
- (2) Remove the wing nuts connecting grounding wire (W246) to AFATDS PCC.
- (3) Disconnect W228, W229, and W227.
- (4) Remove from tray and store.
- (5) Replace wing nut back on PCC.

CHAPTER 4

FUNCTIONAL DESCRIPTION

4-1. INTRODUCTION.

This chapter describes how the equipment comprising the Mobile Tactical Shelter (MTS) performs major operations and functions and how associated systems contribute to its performance. MTS utilizes tactical radio systems, Advanced Field Artillery Tactical Data System (AFATDS) computers, and external antennas that work in conjunction with each other.

4-2. SYSTEM FUNCTION DIRECTORY MTS consists of four main subsystems: shelter, power distribution, radio, and computer network.

a. Shelter Subsystem. MTS is a lightweight transportable shelter used to house various types of equipment as specified by user. MTS is mounted on a High Mobility Multipurpose Wheeled Vehicle (HMMWV).

(1) **Shelter.** Ladder assembly is secured to personnel door during transit and storage, and is restrained by a strap below door when shelter is in operation. Drain plug is loosened for air or rail transport. Step assembly on exterior curbside wall and handhold on shelter roof provide easy access by personnel to shelter roof. Four lifting rings at top corners of shelter provide attachment points for a sling assembly when shelter is lifted onto HMMWV and/or transported.

(2) **Antennas.** MTS uses five antennas, one AS-3449/VSQ-1 Omni-directional and four RF-390A/VRC Multi-band (M-B).

(a) RF-390A/VRC M-B Antenna works in conjunction with Single Channel Ground-to-Air Radio System (SINCGARS) radio to provides exceptional gain and instantaneous bandwidth performance over 30 Megahertz (MHz) to 512 MHz spectrum. It includes Mean Time Between Failure (MTBF) of more than 100,000 hours, capability of operation in 55 knot winds with gusts up to 85 knots, and capability of operation with 4.5 pounds per square inch (psi) of ice coating on antenna.

(b) AS-3449/VSQ-1 Antenna is an Omni-directional vehicular whip antenna designed for tactical conditions using broadband technology. It works in conjunction with Enhanced Position Location Reporting System (EPLRS) radio and provides exceptional gain and instantaneous bandwidth performance over a 30 MHz to 512 MHz spectrum. Unique electrical design puts power pattern on horizon, allowing Line-of-Sight (LOS) and Beyond-Line-of-Sight (BLOS) communications even in harsh conditions, and instantaneous bandwidth for Ethernet enhanced communications manager waveforms.

(3) **Radio Rack.** Radio rack, mounted to front roadside wall of shelter, houses EPLRS radio, EPLRS User Read-out (URO), AN/VRC-110 radio, two AFATDS computers, and AFATDS Power Conditioner/Converter (PCC). Shelves 1 through 5 slide for easy access of EPLRS, SINCGARS, and AFATDS computers while shelf 6 containing the PCC is fixed.

(4) **Air Conditioner.** Supplies cooled or heated air to provide a comfortable working environment inside MTS. Communications, computer, and other equipment inside shelter generate heat when operational, elevating shelter internal temperature. The air conditioner forces air through condenser coils and cools air before circulating throughout shelter.

(5) **Vent Fans.** MTS contains a total of six fans that provide air circulation and ventilation. Two vent fans are located on roadside personnel door and two fans are located on battery compartment door. They exchange air inside shelter with outside air. An additional two fans are mounted on the third and fourth shelves of radio rack. They provide cool air as it passes over AFATDS computers to prevent overheating.

(6) Lighting. Overhead lights in shelter have a setting to illuminate red when shelter doors are opened. When doors are closed, lights illuminate white. Panel, lights at each user workstation have the same feature as overhead lights.

(7) Cabinets. MTS features built-in upper and lower cabinets along curbside interior wall. Two upper cabinets provide storage space. Keyboard mounts are located on the front of cabinet. Lower cabinet also provides storage space. The mouse brackets are located on the sides of the cabinet. Fire Extinguisher. MTS includes a residue-free, carbon dioxide hand-held extinguisher for Type B (flammable and combustible liquids) and Type C fires involving energized electrical equipment. Extinguisher is mounted on roadside wall near entry hatch.

(8) Fire Extinguisher. MTS includes a residue-free, carbon dioxide hand-held extinguisher for Type B (flammable and combustible liquids) and Type C fires involving energized electrical equipment. Extinguisher is mounted on roadside wall near entry hatch.

(9) Plotting Board. Use dry-erase markers only and periodically clean with approved cleaning material.

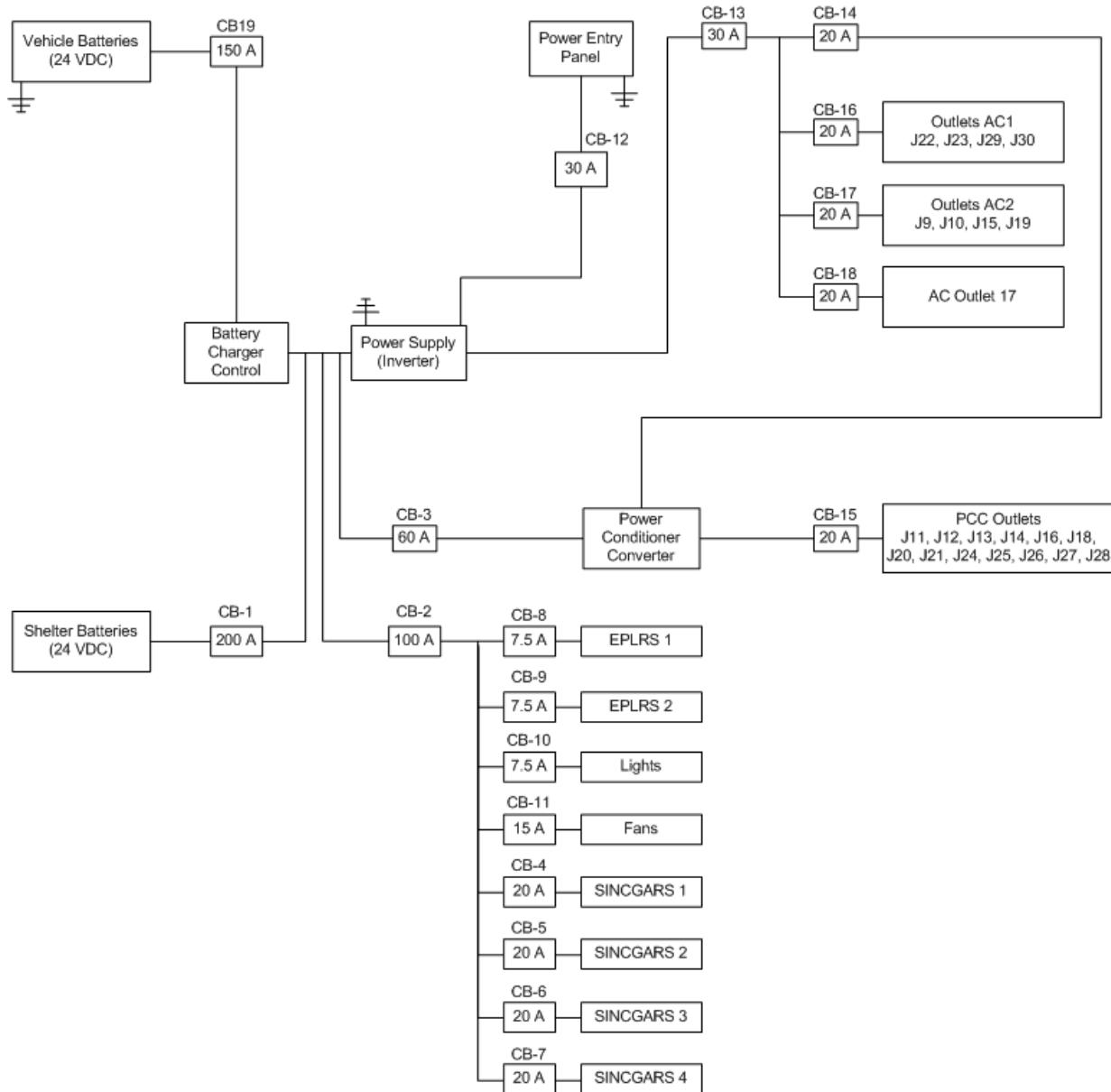


Figure 4-1. Shelter Power Circuit Diagram

b. Power Distribution Subsystem. The shelter is supplied AC power from external generator or DC power from on-board batteries or HMMWV alternator. Batteries generate Voltage Direct Current (VDC), which powers Single Channel Ground-to-Air Radio System (SINCGARS) tray, EPLRS, shelter lights, and vent fans. DC power is routed through power supply (inverter), where it is converted to Alternating Current (AC) power. All power outlets on raceways in shelter use AC power. Components that plug into these AC outlets are two AFATDS computers, four display units, an ADP interface unit, and AFATDS printer. Refer to Figure 4-1 for shelter power circuit diagram.

(1) Power Entry Panel. The power entry panel is located on the curbside exterior of the shelter wall and provides connection for AC input.

(2) Power Distribution Unit. Power Distribution Unit (PDU) contains Circuit Breakers (CBs) for all subsystems within shelter. MTS uses two types of CBs: AC and DC. DC CBs control voltage from batteries. AC CBs control voltage from power supply (inverter). There are three CBs that control power input to the shelter. CB-1 controls on-board battery power, CB-12 controls external AC input, and CB-19 controls vehicle DC input.

NOTE

This section describes the employment of on-board batteries.

(3) Batteries. MTS uses two 12-Volt (V) storage batteries wired in series to produce 24VDC power. These batteries provide power to DC components.

NOTE

MTS batteries may be charged by the vehicle batteries or an external generator. In addition to automatic operation, battery charger control can be manually activated.

(4) Battery Charger Control. The battery charger controller manages MTS, vehicle, and external power sources to ensure MTS batteries remain fully charged, and automatically disconnects MTS batteries from vehicle power if required to prevent depletion of vehicle batteries. Charging sources include vehicle 24VDC and external AC power. A start-assist button, located on remote panel, allows vehicle to be started from MTS batteries. When the battery charger controller is activated, a green indicator light will illuminate.

(5) Power Supply (Inverter). Power supply (inverter) accommodates a wide range of time-based and voltage-level functions and conditions for maximum control of power system. The power supply (inverter) offers a complete power conversion system—DC to AC, battery charging, and an AC transfer switch—and can be used in a stand-alone or mobile back-up application.

(6) Digital Display Indicator. Displays and configures system and components, coordinates system operation, and maximizes performance.

NOTE

AFATDS PCC is unit supplied.

(7) AFATDS Power Conditioner/Converter. The PCC keeps critical electronics running in severe conditions by providing tightly-regulated AC output from a wide range of AC or DC inputs. It provides 115 Volts Alternating Current (VAC) \pm 5% output over an input voltage range of 80 to 265 VAC and a frequency range of 47 to 63 Hertz (Hz), with full input to output isolation, line conditioning, and surge suppression. It operates from tactical AC generator or 24 VDC military vehicle power to power computer equipment loads at a maximum of 1000 Watts (W), or 1250 volt-amperes.

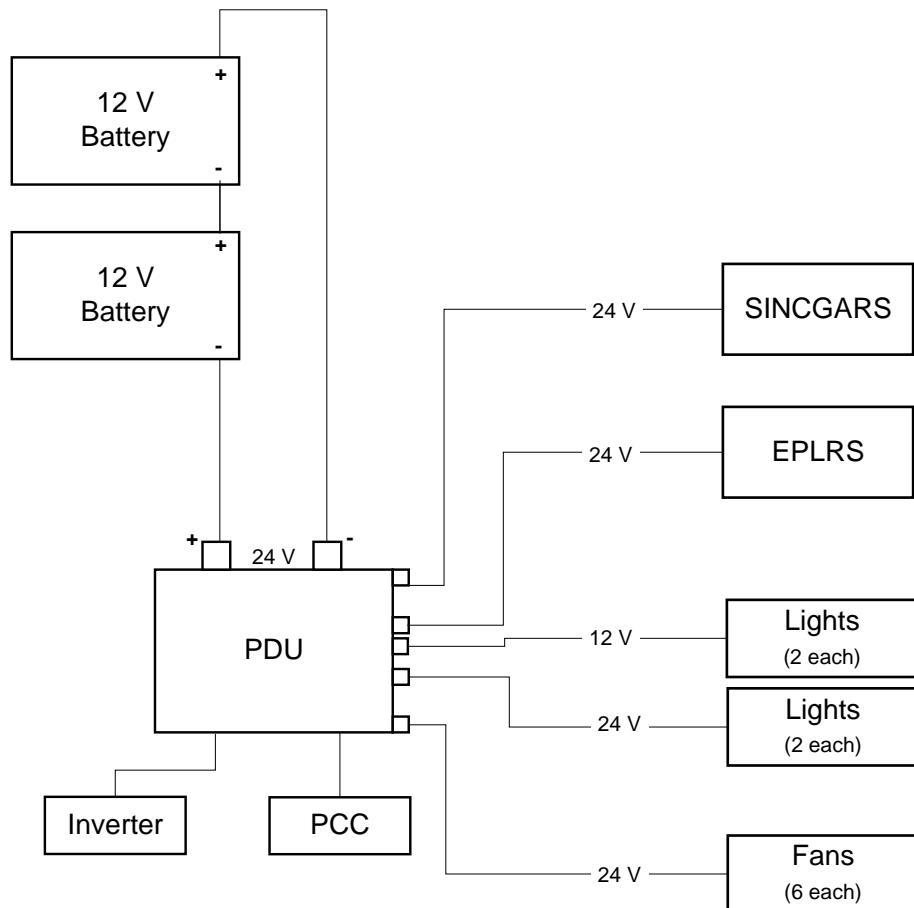


Figure 4-2. Mobile Tactical Shelter Direct Current Circuit Diagram

(8) DC Circuit. Refer to Figure 4-2 for shelter DC circuit diagram. DC power generated by MTS batteries powers the following subsystems:

- Lighting
- Fans
- SINCGARS radios
- EPLRS radios
- AFATDS PCC
- Power Supply Inverter

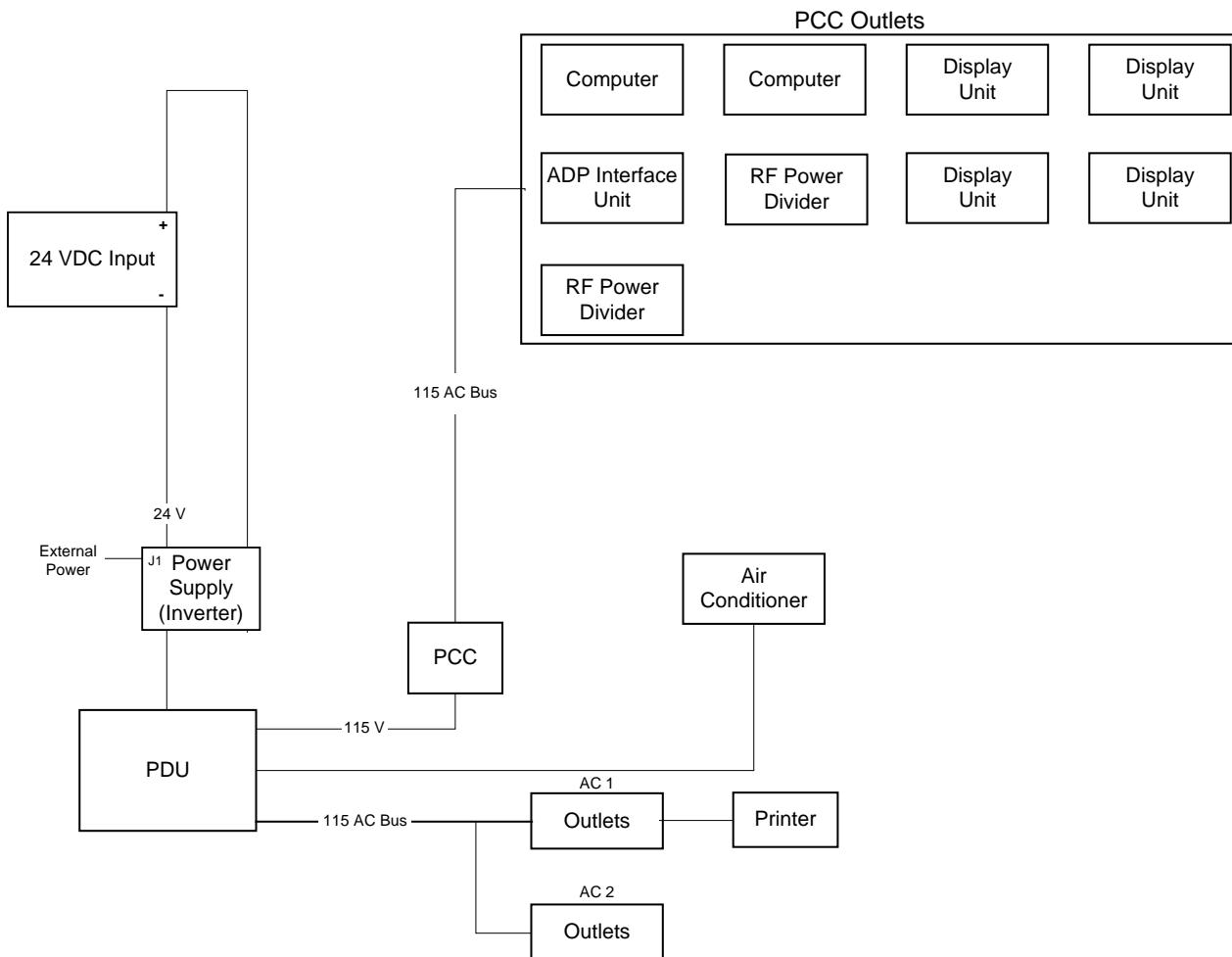


Figure 4-3. Shelter Alternating Current Circuit Diagram

(9) AC Circuit. Refer to Figure 4-3 for shelter AC circuit diagram. Within AC power system there are four circuits, AC1, AC2, air conditioning, and PCC. All of the following components except for the air conditioner and printer utilize the PCC circuit. AC circuits include the following systems:

- AFATDS PCC
- AFATDS Computers
- ADP interface unit
- Air conditioner
- RF power dividers
- AFATDS printer
- Computer display units
- AC power outlets

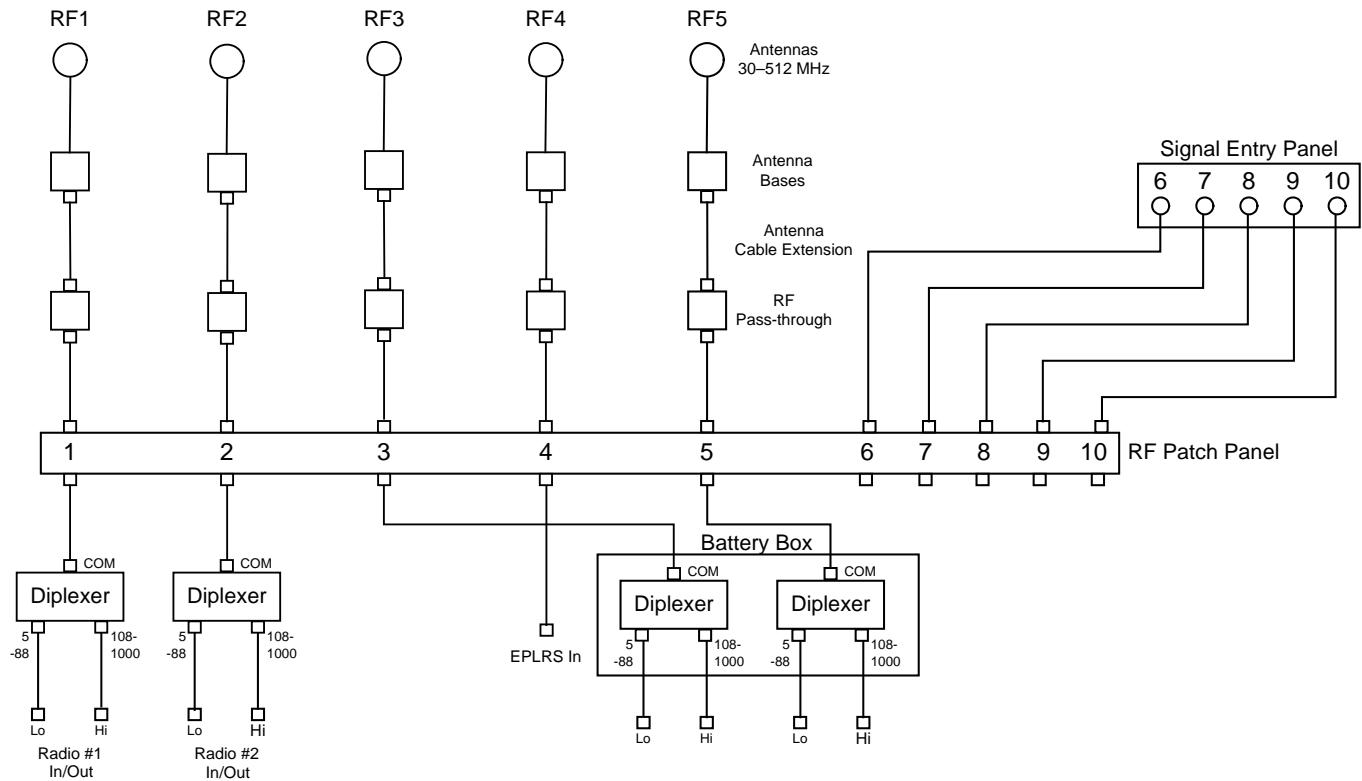


Figure 4-4. Shelter Radio Block Diagram

c. Radio Subsystem. MTS utilizes EPLRS radio suite and AN/VRC-110 radio suite. Refer to Figure 4-4 for the Shelter Radio Block Diagram.

NOTE

All radio subsystem equipment with exception of Keypad Display Unit (KDU) is unit-supplied.

(1) Enhanced Position Location and Reporting System. EPLRS is a digital transmission system that provides LOS radio frequency for accurate and timely computer-to-computer communications in the tactical battlefield. EPLRS allows flexible, seamless communications between Marine Air Ground Task Force (MAGTF) Command, Control, Communications, Computers, and Intelligence (C4I) tactical data systems. The EPLRS URO provides data/message entry and display for radio set. It includes a display for displaying messages and keys for editing and composing messages.

(2) AN/VRC-110 Radio. AN/VRC-110 radio assembly includes two AN/PRC-152 radio handsets, two Vehicle Amplifier Adapters (VAAs), Vehicle Adapter Unit (VAU) and a shock mount. This single-channel M-B, multi-mission radio covers a 30 MHz to 512 MHz frequency range with adjustable transmit output power. User can switch between ground, ground-to-air, or Satellite Communication (SATCOM) by selecting required net on radio.

(3) Handset Units. Two handset units, located in the shelter, can be used to transmit and receive through AN/VRC-110 radios in the vehicle cab. Speaker units are mounted on back door and on roadside wall near rear wall. Speaker does not interface with AN/VRC-110 radios in shelter.

d. AFATDS Computer Subsystem. MTS computer network consists of two AFATDS computers, four display units, two RF power dividers, two keyboards, two mouse devices, and one ADP interface unit.

(1) ADP Interface Unit. Provides eight 10/100 ports with Power over Ethernet (PoE) and one dual-purpose 10/100/1000 and small form-factor pluggable port for maximum productivity. Identity-based networking service provides authentication, access control, and security policy administration to secure network connectivity and resources.

- Ethernet ports are located on front panel of switch. Port 1 supports 802.3af PoE PD standard that supplies DC power to switch using twisted-pair cable. Any 802.3af-compliant PoE device attached to port can directly supply power to switch over twisted-pair cable without requiring its own separate power source.
- Ports 1 through 8 support network speeds of 10 Megabits per second (Mbps), 100 Mbps, or 1000 Mbps and can operate in half- and full-duplex modes. Auto-sensing technology enables each port to automatically detect speed of connected device and adjust speed and duplex accordingly.

NOTE

AFATDS computers and printer are unit supplied.

(2) AFATDS Computers. The AFATDS computer contains duo processor for the best wireless access and performance in various applications. It comes equipped with 14.1-inch sunlight readable LCD screen. The computer is adaptable to outdoors without interference by direct sunlight. It includes magnesium alloy case, shock-protected Hard Disk Drive (HDD), and waterproof keyboard and touchpad.

(3) Display Units. MTS incorporates four, 20-inch display units, two on interior curbside wall and two on interior curbside rear personnel door. Two display units connect to each AFATDS computer through a RF power divider. Left display unit on curbside wall and top display unit on curbside rear personnel door display the same information. Right display unit on curbside wall and bottom display unit on curbside rear personnel door display the same information. Display units feature easy, on-screen menu adjustments and technology that automatically adjusts backlight to ambient brightness.

(4) Mounting Brackets. MTS includes brackets that hold display units in place. Brackets are adjustable, allowing display units to tilt and oscillate to provide optimum viewing angle for operator. Brackets and display units are pre-installed before shelter is shipped to operational theater. Keyboard and Mouse. MTS uses two standard keyboards and two optical zoom mouse devices to operate user workstations. Keyboards feature user-selectable, zero-degree slope for wrist-posture improvement and comfort and a spill-drain feature to minimize damage from accidental fluid spill. Two-button optical mouse features scroll wheel providing speed and accuracy of optical tracking. Both keyboard and mouse connect to standard Universal Serial Bus (USB) ports.

(6) AFATDS Printer. MTS includes straps to hold the unit-supplied AFATDS printer in place.

CHAPTER 5

OPERATIONS

5-1. INTRODUCTION.

This chapter details the components, controls, indicators, and connectors found on the Mobile Tactical Shelter (MTS). Specific preoperational conditions presumed to be in effect prior to system operation shall also be discussed. It includes the methods to operate systems located in MTS, including system operating situations, modes, and procedures.

5-2. CONTROLS, INDICATORS, AND CONNECTIONS.

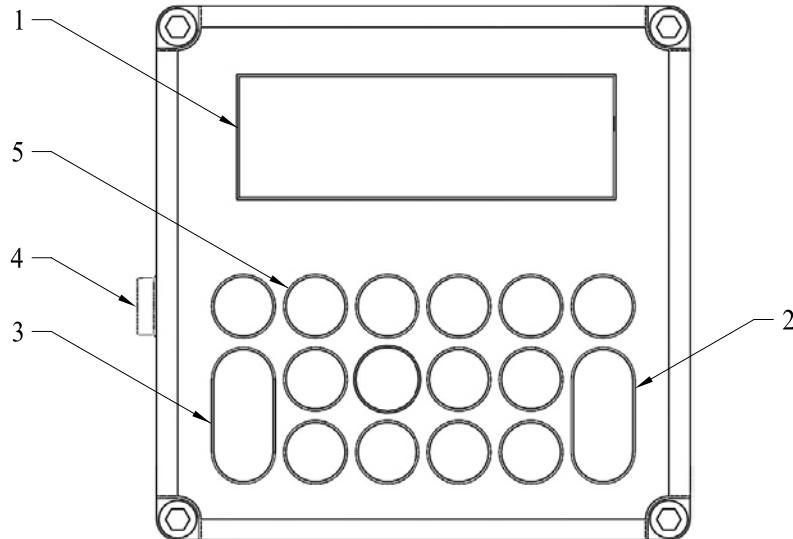


Figure 5-1. Keyboard Display Unit Controls and Indicators

Table 5-1. Keyboard Display Unit Controls and Indicators

Key	Control or Indicator	Function
1	Display	Liquid Crystal Display (LCD) allows the user to view the on-screen messages.
2	Preset button	Allows the user to preset the radio.
3	Volume button	Allows the user to control the volume.
4	Extension connector	Connects to the extension cable.
5	Keypad	Allows the user to enter specific commands to the radio.

a. Keyboard Display Unit. Removable cable remote Keyboard Display Unit (KDU) including LCD with adjustable backlight and contrast levels. Removal of KDU serves to protect complete access to loaded Communications Security (COMSEC) keys. Refer to Figure 5-1 for a depiction of the KDU. Refer to Table 5-1 for KDU controls and indicators.

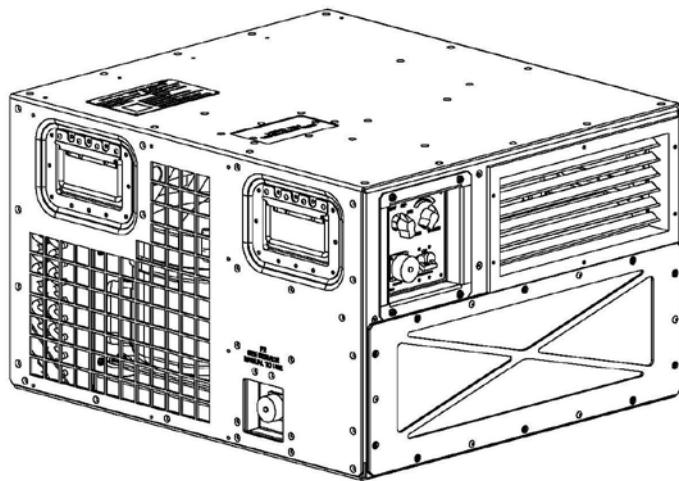


Figure 5-2. Air Conditioner

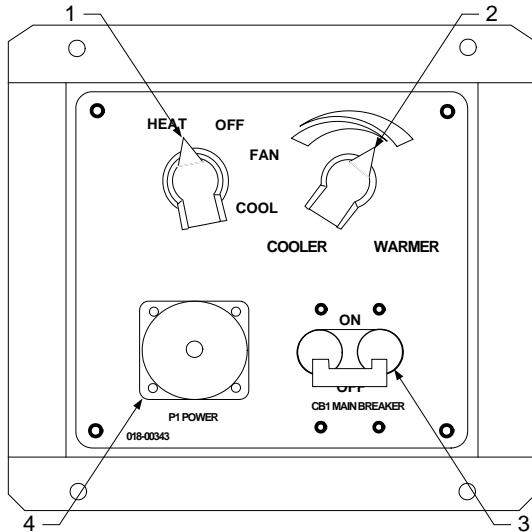


Figure 5-3. Air Conditioner Control Panel Controls and Indicators

Table 5-2. Air Conditioner Control Panel Controls and Indicators

Key	Control or Indicator	Function
1	Operation control switch	Selects mode of operation.
2	Temperature control knob	Controls air temperature between 60° to 90° F.
3	CB1 main breaker	Power protection for air conditioner.
4	Power connection	Connection for power cord.

b. Air Conditioner. Air conditioner supplies cooled or heated air to provide a comfortable working environment inside shelter. Refer to Figure 5-2 and Figure 5-3 for views of the air conditioning and the air conditioner control panel. Refer to Table 5-2 for air conditioner controls and indicators.

NOTE

Power supply (inverter) control terminal wiring block shown in Figure 5-5 is located on top in middle of control panel of the power supply (inverter).

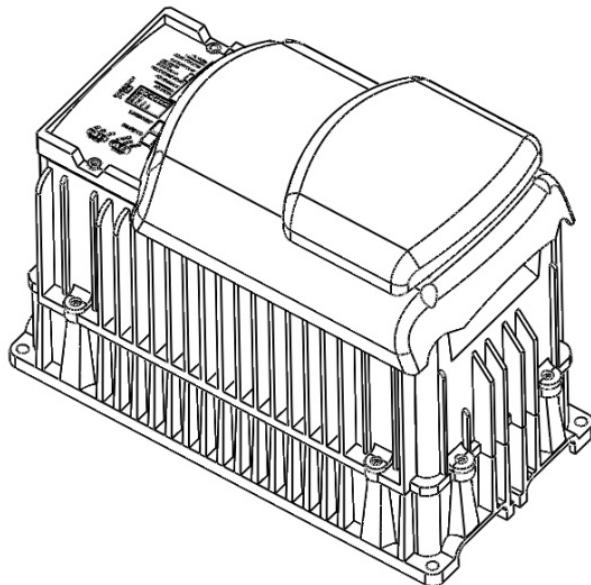


Figure 5-4. Power Supply (Inverter)

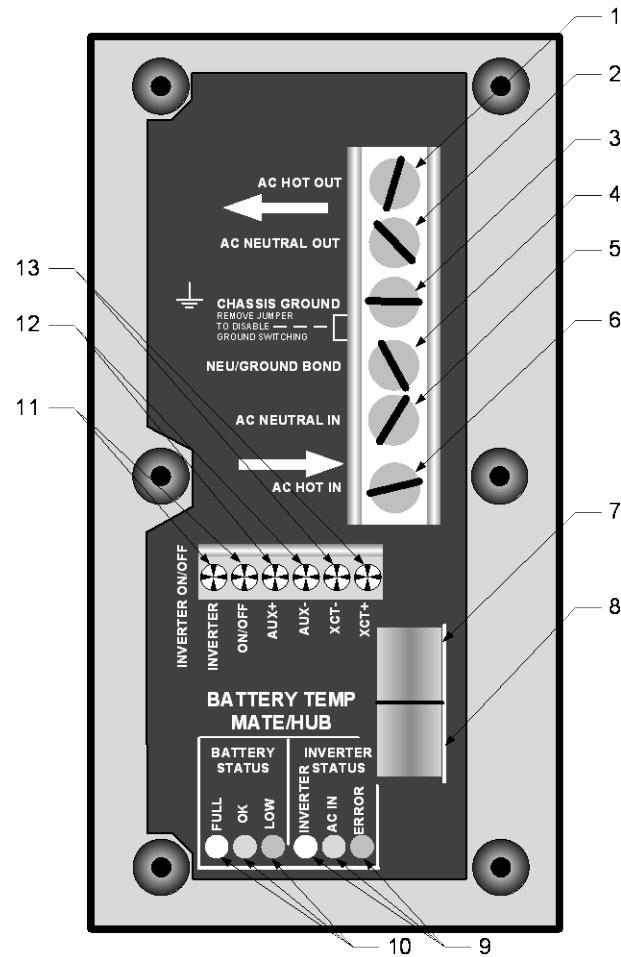


Figure 5-5. Power Supply (Inverter) Terminal Block Controls and Indicators

Table 5-3. Power Supply (Inverter) Controls and Indicators

Key	Control or Indicator	Function
1	AC HOT OUT	Supplies Alternating Current (AC) hot output conductors through a 30 Ampere maximum AC branch-rated CB.
2	AC NEUTRAL OUT	Connects AC neutral input conductor to AC neutral out terminal.
3	CHASSIS GROUND	Connects AC output neutral conductors to chassis ground terminal while inverting.
4	NEU/GROUND BOND	Connects AC output neutral conductors neutral/ground bond terminal while inverting.
5	AC NEUTRAL IN	Connects AC neutral input conductor to AC neutral in terminal.
6	AC HOT IN	AC hot input conductor (black) must be supplied through a 30 Ampere maximum AC branch-rated CB and connected to AC HOT IN.
7	RJ-11 jack	Connects optional external battery temperature sensor.
8	RJ-45 jack	Connects digital display indicator to power supply (inverter).

Table 5-3. Power Supply (Inverter) Controls and Indicators (Continued)

Key	Control or Indicator	Function
9	Inverter status indicators	Refer to Table 5-4.
10	Battery status indicators	Refer to Table 5-5.
11	INVERTER ON/OFF	Allows manual or remote switch to control power supply (inverter) (default is ON).
12	AUX +/AUX –	12 Volts Direct Current (VDC) at 0.7 amp (8.4 Watts (W)) maximum is available at these terminals; AUX output default mode is to drive cooling fans.
13	XCT+/XCT-	These terminals are not operational at this time.

Table 5-4. Power Supply (Inverter) Status Indicators

LED Color	LED Action	Indicator
Green (Inverter)	Solid	Inverter ON.
	Flashing	Search mode of slave power.
	Off	Inverter OFF.
Yellow (AC IN)	Solid	AC source connected.
	Flashing	AC input life—waiting to connect to power supply (inverter).
	Off	No AC input present.
Red (Error)	Solid	Error—error message displays on digital display indicator.
	Flashing	Warning—non-critical fault occurred to power supply (inverter); digital display indicator can access information.

Table 5-5. Power Supply (Inverter) Battery Status Indicators

LED Color	Indicator	24 VDC
Green	Full	≥ 24.8
Yellow	OK	23.0 to 24.8
Red	Low	< 23.0

c. Power Supply (Inverter). Power supply (inverter) control terminal wiring block is located on top in middle of control panel of the power supply (inverter). It allows user to view, monitor, and establish all pertinent settings that occur while system is running. Settings might be adjusted as components are added or upgraded, electrical loads increase, or patterns of usage change. Refer to Figure 5-4 for a depiction of the MTS power supply (inverter) and Figure 5-5 for a detailed view of the power supply (inverter) terminal block. Refer to Table 5-3, Table 5-4, and Table 5-5 for descriptions of the power supply (inverter) functions.

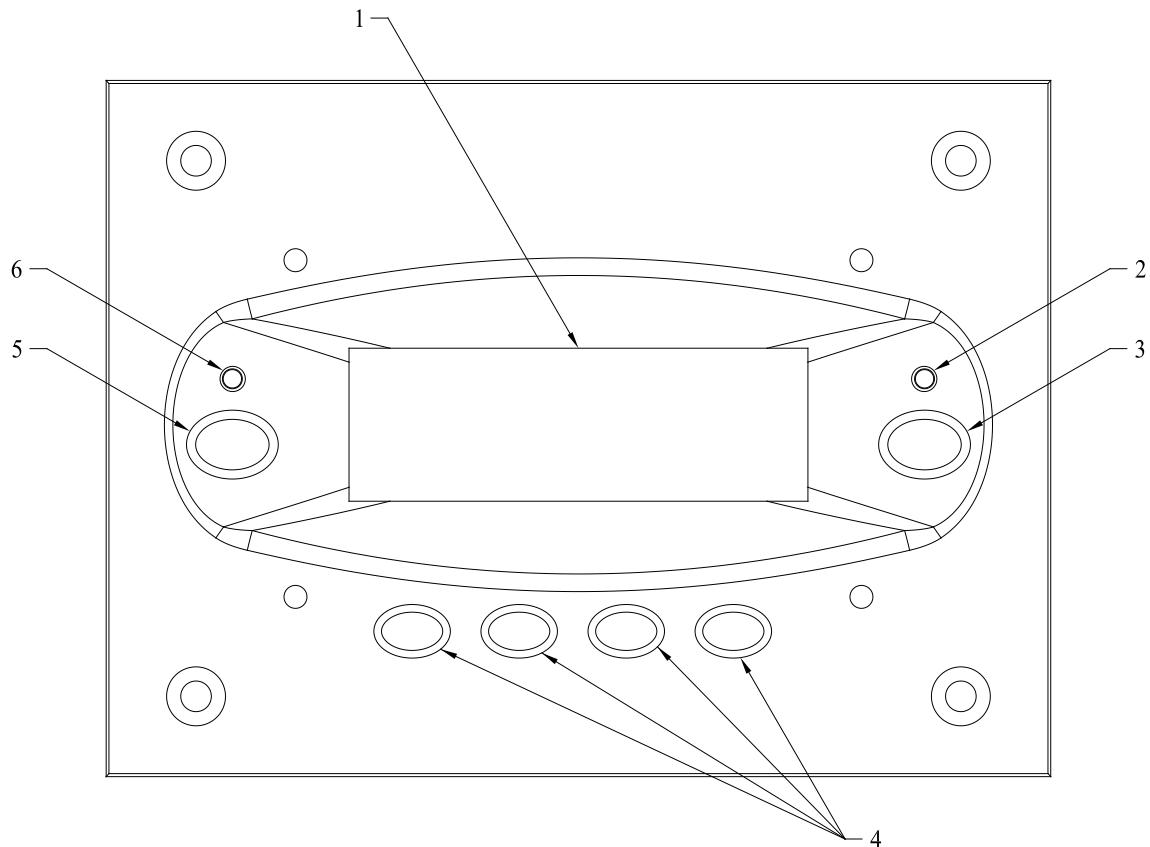


Figure 5-6. Digital Display Indicator Controls and Indicators

Table 5-6. Digital Display Indicator Descriptions Controls and Indicators

Key	Control or Indicator	Function
1	Liquid Crystal Display (LCD)	Displays status and messages for power supply (inverter).
2	Green LED	Inverter status indicator.
3	INV button	Inverter hot key.
4	Soft keys (4)	Used to navigate through power supply (inverter) system commands and menus.
5	AC IN button	AC input hot key.
6	Yellow LED	AC input status indicator.

Table 5-7. Digital Display Indicator Screens

Screen	Description
System Controller Version	<ul style="list-style-type: none"> • Code indicates power supply (inverter) operation and features. • Serial # matches bar code sticker inside power supply (inverter) on circuit board. • Screen EE refers to power supply (inverter) menu system.
FX Device Found	Indicates power supply (inverter) has found an FX series power supply (inverter).
CC Device Found	Indicates power supply (inverter) has found a charge controller (CC).
DC Device Found	Indicates power supply (inverter) has found Flexner DC.
Hub Device Found	Indicates power supply (inverter) has found the hub.
Port Assignment	Each port used shows its connected component.
No Devices Found	Indicates power supply (inverter) has not found any connected devices; refer to Chapter 7, Troubleshooting.

d. Digital Display Indicator. Displays and configures system and components, coordinates system operation, and maximizes performance. Refer to Figure 5-6 for a depiction of digital display indicator. Refer to Table 5-6 for a description of digital display indicator functions. Refer to Table 5-7 for digital display indicator screens.

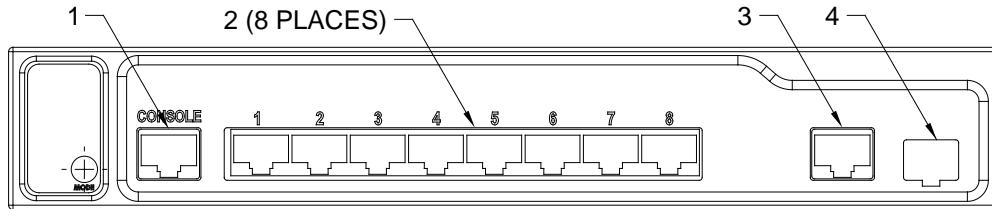


Figure 5-7. Automated Data Processing (ADP) Interface Unit Front Panel Controls, Indicators, and Connectors

Table 5-8. Automated Data Processing Interface Unit Front Panel Controls, Indicators, and Connectors

Key	Control, Indicator, or Connector	Function
1	RJ-45 console port	Provide local connectivity to the console (Network administrator use only).
2	Ports 1 – 8	Provides Ethernet connection to indicated port.
3	RJ-45 auxiliary port	Provides out of band or local connectivity to the console. (Network administrator use only).
4	SFS port	Not used for MTS configuration.

e. Automated Data Processing Switch. Provides one console port, eight 10/100 ports with Power over Ethernet (PoE), one auxiliary 10/100 port, and one small form-factor pluggable (SFP) port that functions as a dual-purpose port. The SFP is not used for MTS. The console and auxiliary ports are used to update ADP software and for ADP configuration. Refer to Figure 5-7 for a view of ADP interface unit. Refer to Table 5-8 for a description of ADP interface unit connectors and indicators.

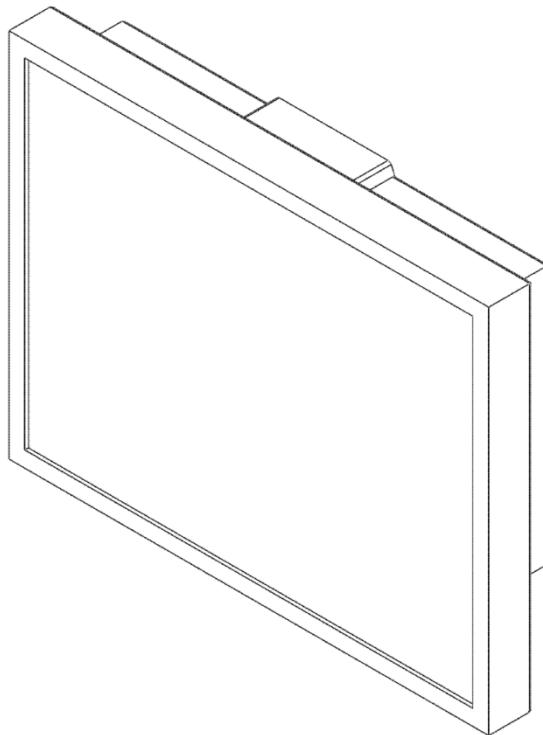


Figure 5-8. Display Unit

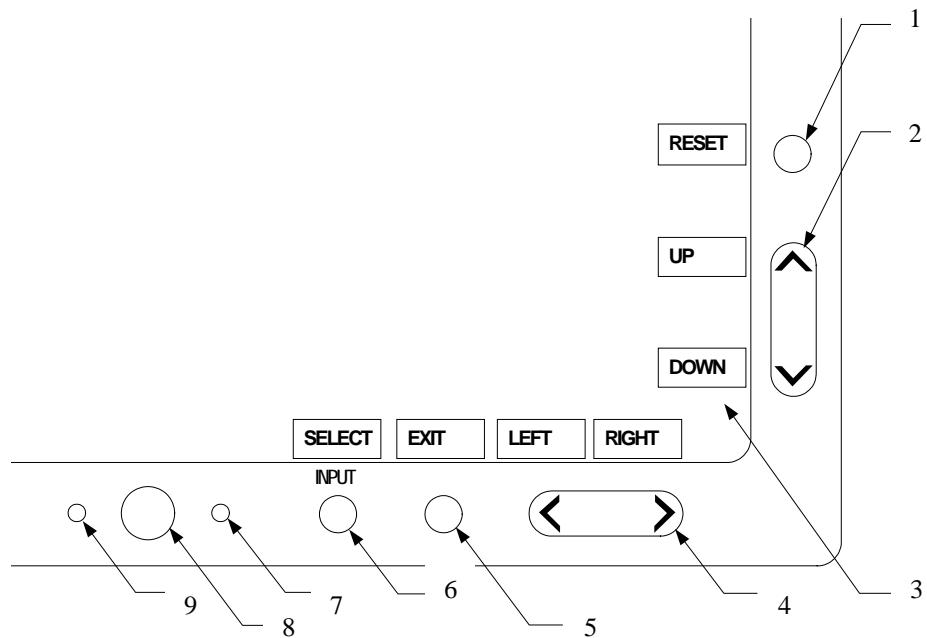


Figure 5-9. Display Unit On-Screen Menu (OSM) Controls and Indicators

Table 5-9. Display Unit OSM Controls and Indicators

Key	Control or Indicator	Function
1	Reset/Rotate OSM	Resets OSM to factory settings. Pressing when OSM is not displayed rotates OSM control menu between portrait and landscape mode.
2	Up/Down button	Navigates selection up or down through OSM control menu.
3	Key guide	Key Guide appears on-screen when OSM control menu displays.
4	Left/Right button	Navigates selection to left or right through OSM control menu.
5	Exit	Exits OSM submenu. Exits OSM control menu.
6	Input>Select button	Enters OSM control menu or OSM submenu. Changes input source when not in OSM control menu.
7	Power Light Emitting Device (LED)	Indicates power is ON.
8	Power button	Turns monitor on and off.
9	AmbiBright™ sensor	Detects level of ambient light and automatically adjusts for a more comfortable viewing. Do not cover this sensor.

f. Display Unit. Display units installed in MTS use OSM controls to adjust viewing settings. Refer to Figure 5-8 and Figure 5-9 for views of the display unit and the display unit controls. Refer to Table 5-9 for a description of the controls and indicators. Refer to the NEC MultiSync LCD User's Manual for more detailed instructions on adjusting display unit image.

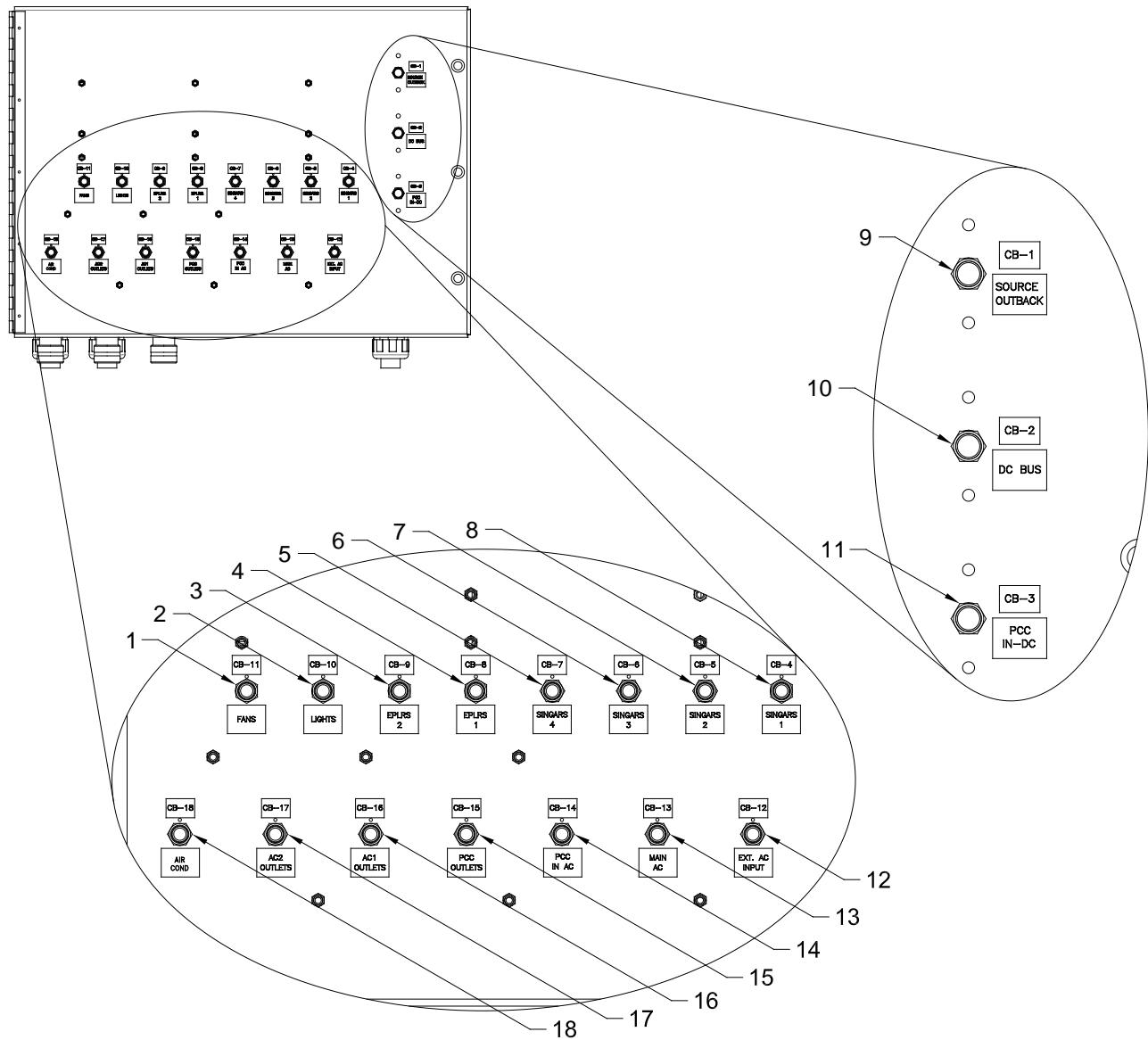


Figure 5-10. Power Distribution Unit (Front View)

NOTE

CB-19 is located below the PDU on the side of the battery box.

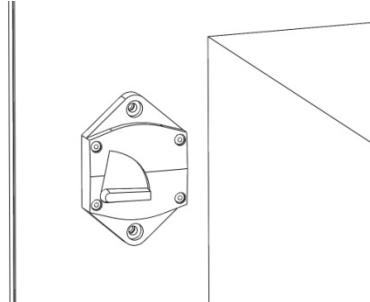


Figure 5-11. Circuit Breaker 19

Table 5-10. Power Distribution Unit Circuit Breakers

Key	CB No.	Description	Function
1	CB-11	FANS	Provides 24VDC power to the fans.
2	CB-10	LIGHTS	Provides 24VDC power to the lighting system.
3	CB-9	EPLRS 2	Provides 24VDC power.
4	CB-8	EPLRS 1	Provides 24VDC power.
5	CB-7	SINGCARS 4	Provides 24VDC power to SINGCARS outlets, one per outlet.
6	CB-6	SINGCARS 3	Provides 24VDC power to SINGCARS outlets, one per outlet.
7	CB-5	SINGCARS 2	Provides 24VDC power to SINGCARS outlets, one per outlet.
8	CB-4	SINGCARS 1	Provides 24VDC power to SINGCARS outlets, one per outlet.
9	CB-1	SOURCE OUTBACK	Removes all power from shelter when pulled. DC source for power supply (inverter).
10	CB-2	DC BUS	Removes all DC power from shelter interior when pulled. Power still present at power supply (inverter).
11	CB-3	PCC IN-DC	DC power source for PCC.
12	CB-17	AC 2 OUTLETS	Powers AC 2 outlets in shelter.
14	CB-15	PCC OUTLETS	Provides AC power from PCC.
13	CB-16	AC 1 OUTLETS	Powers AC 1 outlets in shelter.
15	CB-14	PCC IN AC	Provides AC power to PCC.
16	CB-13	MAIN AC	Provides AC power from power supply (inverter).
17	CB-12	EXT. AC INPUT	External AC power to power supply (inverter).
18	CB-18	AIR COND	Powers air conditioner.

g. Power Distribution. The Power Distribution Unit (PDU) and Circuit Breaker 19 contains all Circuit Breakers (CBs) for all subsystems within shelter. Shelter utilizes two types of CBs, AC and DC. DC CBs provide voltage from batteries. AC CBs control voltage from power supply (inverter). They also provide overload protection to the equipment. Refer to Figure 5-10 for a depiction of shelter PDU. Refer to Figure 5-11 for a depiction of CB-19. Refer to Table 5-10 for PDU individual CB functionality.

WARNING

SERIOUS ELECTRICAL HAZARDS EXIST WHEN WORKING WITH VEHICLE/SHELTER BATTERY SYSTEM. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, TAKE APPROPRIATE PRECAUTIONS.

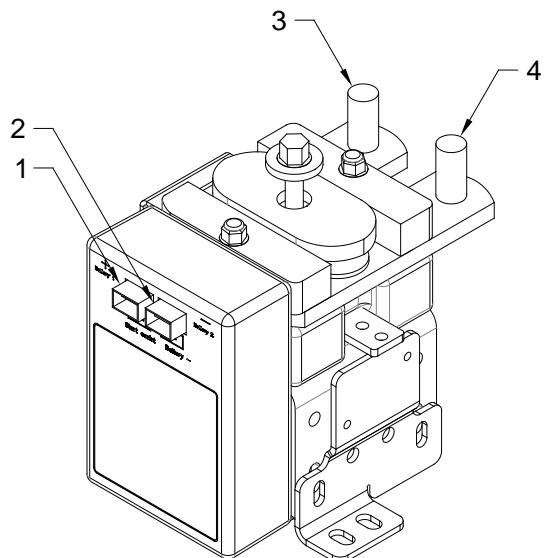


Figure 5-12. Battery Charger Control Indicators and Connectors

Table 5-11. Battery Charger Control Indicators and Connectors

Key	Indicator	Function
1	Start Assist light	Illuminates when an external power source is applied.
2	Battery - light	Illuminates when using MTS battery power.
3	Bat 1 (P1)	Supplies power from CB-19 and vehicle batteries (W230).
4	Bat 2 (P2)	Supplies power from MTS batteries (W214).

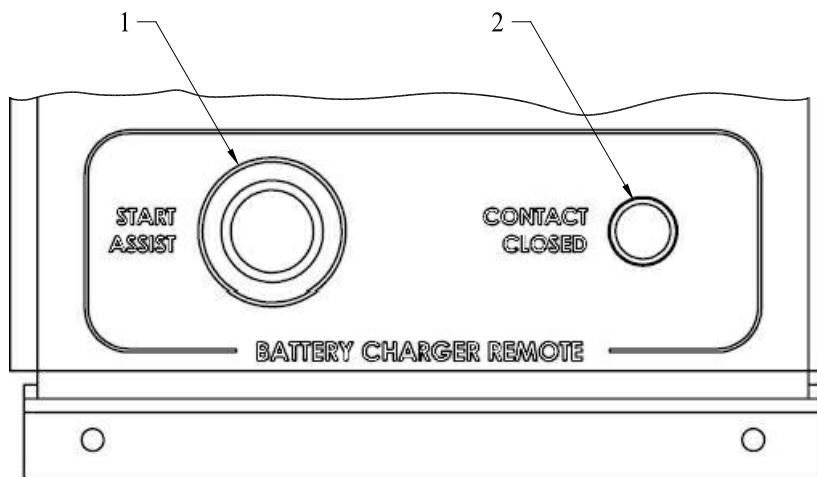


Figure 5-13. Battery Charger Control Remote Panel Controls and Indicators

Table 5-12. Battery Charger Control Remote Panel Controls and Indicators

Key	Indicator	Function
1	Start Assist control and indicator	Press to connect MTS batteries to external source.
2	Contact closed indicator	Illuminates when an external power source is applied.

h. Battery Charger Control. An onboard battery bank provides power to all systems used in MTS. Output voltage of batteries is monitored by the battery charger control system. If output voltage falls below a preset value, battery charger control connects vehicle batteries parallel to MTS batteries. Major components of the battery charger control system include control module and remote panel. Remote panel is mounted on front wall and is connected to control module by a cable. Remote panel provides convenient operation of battery charger control system. Refer to Figure 5-12 for a depiction of the battery charger control. Refer to Figure 5-13 for a depiction of the battery charger control remote panel. Refer to Table 5-12 for a description of battery charger control remote panel controls and indicators.

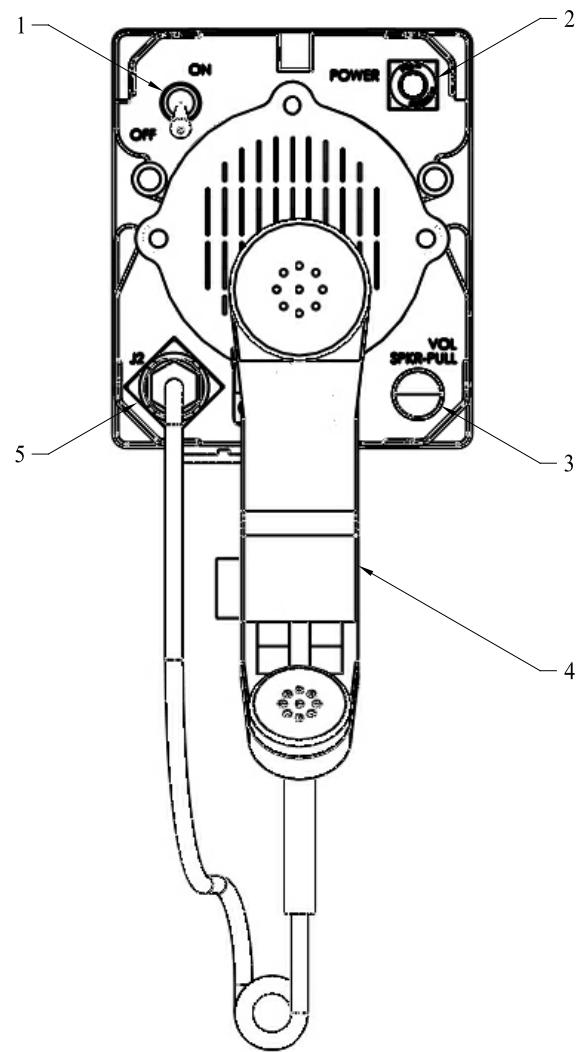
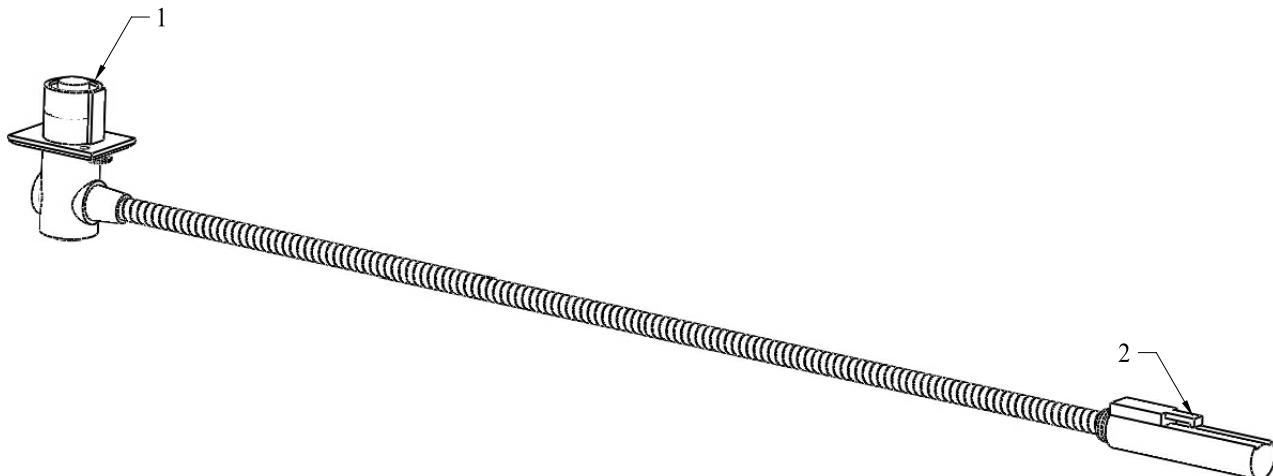
**Figure 5-14. Loudspeaker Control Unit Components**

Table 5-13. Loudspeaker Control Unit Components

Key	Components	Function
1	Power toggle switch	Powers the speaker on and off.
2	Power connector	Connects to power supply.
3	Volume control	Allows the user to raise or lower the volume.
4	Handset	Used to communicate.
5	Extension connector	Attaches handset to the loudspeaker control unit.

i. **Loudspeaker Control Unit.** The two loud speakers, located in MTS, can be used to transmit and receive through AN/VRC-110 radios in vehicle's cab. Loud speaker units are mounted on back door and on roadside wall near rear wall. Loud speaker does not interface with AN/VRC-110 radios in shelter. Refer to Figure 5-14 for a depiction of the loudspeaker. Refer to Table 5-13 for loudspeaker components.

**Figure 5-15. Panel, Light Controls, Indicators, and Connectors****Table 5-14. Panel, Light Controls, Indicators, and Connectors**

Key	Control, Indicator, or Connector	Function
1	Connector	Connects to power supply.
2	Light function	Normal Operation—Light output is white when door is closed and red when door is open.

j. **Panel Lights.** Panel, lights are controlled by CB-10 and the light switch beside the rear door. Both must be in the on position for lights to operate. Refer to Figure 5-15 for a depiction of panel, lights. Refer to Table 5-14 for descriptions of controls and indicators.

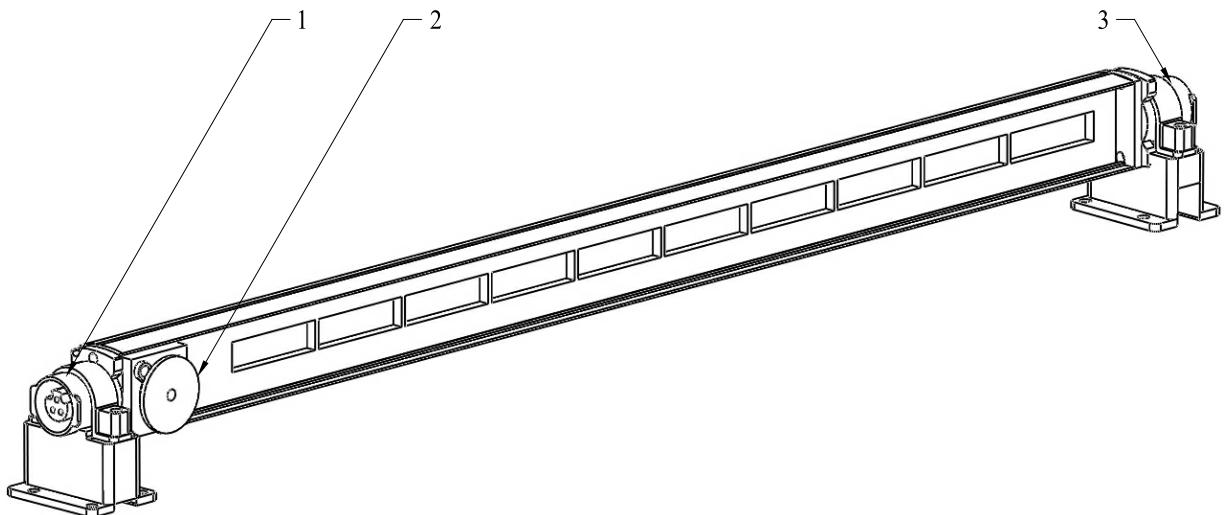


Figure 5-16. Overhead Light Controls and Indicators

Table 5-15. Overhead Light Components Controls and Indicators

Key	Controls, Indicators, or Connectors	Function
1	Connector	Connects to power supply.
2	Brightness control	Rotates to control the intensity of the light.
3	Light Function Switch	<ul style="list-style-type: none"> • Normal Operation—Set switch to center position. Light output is white when door is closed and red when door is open. • White Override—Light output is white regardless of rear door position. • Red Override—Light output is red regardless of rear door position.

k. Overhead Lights. Overhead lights are controlled by CB-10 and the light switch beside the rear door. Both must be in the on position for light to operate. Overhead lights rotate for best viewing. Refer to Figure 5-16 for a depiction of the overhead lights. Refer to Table 5-15 for descriptions of overhead light components.

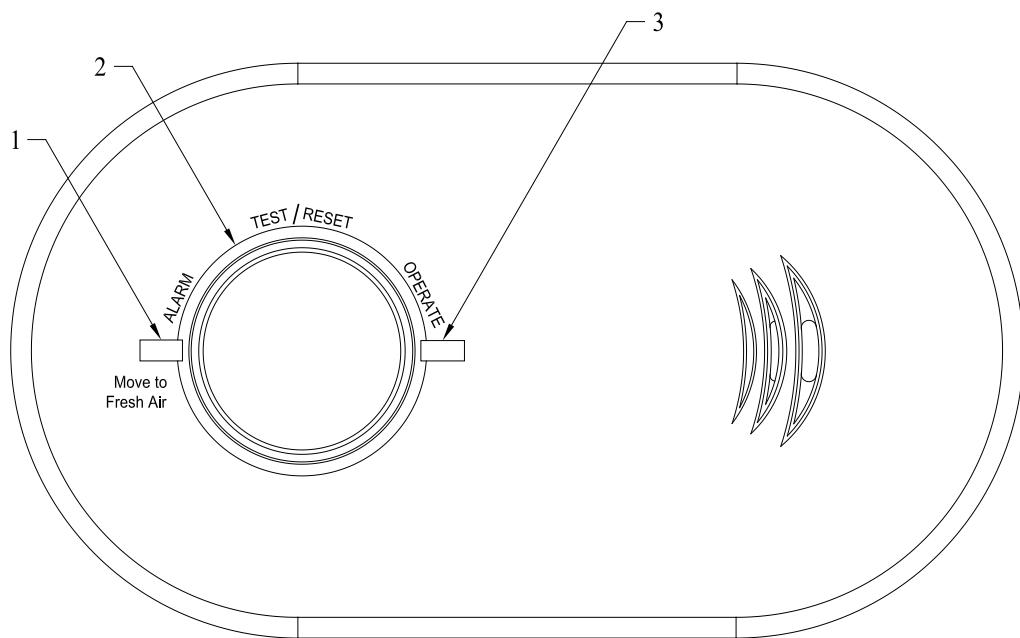


Figure 5-17. Carbon Monoxide Detector Controls and Indicators

Table 5-16. Carbon Monoxide Detector Components Controls and Indicators

Key	Controls and Indicators	Function
1	Alarm indicator (red)	Illuminates red when carbon monoxide is detected.
2	Test/Reset button	Used to test or reset the detector.
3	Power On indicator (green)	Illuminates green when DC power is detected, normal operation.

1. Carbon Monoxide Detector. This battery-operated carbon monoxide detector provides detection and warning against the dangers of carbon monoxide. Refer to Figure 5-17 for a depiction of the carbon monoxide detector. Refer to Table 5-16 for carbon monoxide detector controls and indicators.

5-3. OPERATING MODES.



ENSURE SHELTER GROUNDING HAS BEEN COMPLETED PRIOR TO APPLYING POWER. FAILURE COULD RESULT IN SEVERE PERSONNEL INJURY OR DEATH.



- Ensure CB-1, CB-2, CB-3, CB-12, and CB-19 inside shelter are in open position. Do not apply power to MTS with these CBs in closed position. Doing so could damage CBs and electronic components in shelter.
- To avoid damage to equipment, vehicle should not be in operational mode and engine should be switched off.
- To avoid damage to equipment, remove all items from the exterior shelf before operating the air conditioner.



This procedure assumes all systems are installed in shelter and ready for operation.

- a. Preparation. Prior to operating MTS, ensure the following conditions are met:

- Vehicle parked on proper site selection. Refer to Chapter 3.
- Vehicle wheel chocks in place.
- System grounding and shelter connected.
- One AS-3449/VSQ-1 and four RF-390A/VRC antennas installed.
- Weather flaps for impeller fans rolled up and secure.
- Cable W226 (shelter to vehicle power cable) is plugged into vehicle power outlet and into MTS DC power input.
- Remove air conditioner cover and ensure that all items are removed from exterior shelf before operating the air conditioner.

- b. Shelter Operating Modes. Normal operation which is standard usage and degraded operation which is usage in crisis circumstances and allows a limited number of MTS components to operate under restricted power conditions.

5-4. NORMAL OPERATION, POWER UP SUBSYSTEMS.**WARNING**

ENSURE SHELTER GROUNDING HAS BEEN COMPLETED PRIOR TO APPLYING POWER. FAILURE COULD RESULT IN SEVERE PERSONNEL INJURY OR DEATH.

CAUTION

- Ensure CB-1, CB-2, CB-3, CB-12, and CB-19 inside shelter are in open position. Do not apply power to MTS with these CBs in closed position. Doing so could damage CBs and electronic components in shelter.
- To avoid damage to equipment, vehicle should not be in operational mode and engine should be switched off.
- To avoid damage to equipment, remove all items from the exterior shelf before operating the air conditioner.

a. Power Subsystem.

(1) Shelter Power Options. Shelter main power source is 24VDC, which can be supplied by MTS batteries or vehicle batteries. Shelter can also be powered by 115 V external generator.

(2) Vehicular Power. Use this procedure to apply power to MTS using vehicle power from High Mobility Multipurpose Wheeled Vehicle (HMMWV).

(a) With vehicle engine running, close CB-1, CB-2, CB-3, and CB-19 to apply power to shelter systems.

(b) Verify digital display inverter status indicator is green. If status indicator is not illuminated, refer to Chapter 7 for fault isolation or replacement.

(c) Verify battery charger control indicator is illuminated which indicates power is present and MTS batteries are charging. If indicator is not illuminated, refer to Chapter 7 for fault isolation or replacement.

(d) Close CB-12, CB-13, CB-14, CB-15, CB-16, and CB-17. Refer to Table 5-30 for a list of individual CBs.

(e) Power on PCC and ensure ADP interface unit is powered on.

(f) Turn on air conditioner using the following steps.

1 Ensure AC power cord is plugged into unit at P1 and into outlet J17 (air conditioner) located on upper front wall.

2 Ensure Operation Control switch is in the OFF position.

3 Close CB-18.

4 Close CB-1 Main Breaker on air conditioner front panel.

5 Select mode option as follows:

- In Cool mode, compressor runs continually and thermostat cycles system bypass for temperature control.
- In Fan mode, fans run continually for air circulation.
- In OFF mode, no heating or cooling takes place.
- In Heat mode, thermostat cycles heater for temperature control.

6 Set temperature control knob.

- Turn control knob clockwise to increase temperature in shelter.
- Turn control knob counter-clockwise (CCW) to decrease temperature in shelter.



**SPINNING BLADES ON VENT FANS CAN CAUSE SEVERE INJURY OR AMPUTATION.
USE EXTREME CARE TO PREVENT INJURY TO PERSONNEL.**



To prevent damage to equipment, roll up and secure all ventilation fan covers before operating fans (CB-11).

(g) Ventilation Fans. Four ventilation fans exchange air inside shelter with fresh outside air. Two are located on the battery compartment door and two are located on the secondary personnel door. There are two additional fans mounted on radio rack (to force air over computers for cooling).

1 Roll up and secure all ventilation fan covers.

2 Close CB-11 to start fans.

3 Ensure battery compartment ventilation fans are operational.

4 Ensure shelter door ventilation fans are operational.

5 Ensure radio rack ventilation fans are operational.

(h) Lights. Perform the following steps to turn on the lights:

1 Close CB-10.

2 Turn power switch, located on back wall just inside curbside door, to ON (up position). This switch must be on for light operation.

3 Set overhead lighting function switch for desired operation. Function switch is located on end of each light fixture.

- Normal Operation—Set switch to center position. Light output is white when door is closed and red when door is open.
- White Override—Light output is white regardless of rear door position.
- Red Override—Light output is red regardless of rear door position.

4 Ensure two panel, lights are operational.

b. Radio Subsystems.

- (1) Close CB-8 and CB-9.
- (2) Power on EPLRS radio system.
- (3) Close CB-4, CB-5, CB-6, and CB-7.

(a) Power on AN/VRC-110 radio system and verify green light is illuminated. If amber, refer to TM 11496A-OI/3.

- (b) Power on Loud Speaker. Pull volume knob out for speaker operation and adjust to desired level.
- (c) Power on the four display units.
- (d) Power on printer.
- (e) Ensure AFATDS computers are operational including mouse devices, keyboards, and display units.

NOTE

This procedure assumes all systems are installed and operation.

(4) Generator Power

- (a) Properly ground generator and MTS.
- (b) Connect W252 (generator pigtail cable) to load studs on generator.
- (c) Connect W201 (shelter to generator power cable) to power entry panel on MTS and W252 cable attached to generator.
- (d) Start generator and apply load to provide AC power to the MTS.
- (e) Verify power supply (inverter) digital display indicator AC input indicator is illuminated yellow. The AC input indicator flashes yellow while initializing. When AC power is connected, the AC input indicator will remain solid yellow and the power supply (inverter) DC status indicator will go off.

5-5. NORMAL OPERATIONS, POWER DOWN AND SECURE SUBSYSTEMS.

- a. Power down AFATDS computer as per AFATDS Job Aids.
- b. Power down printer.
- c. Power down display units.
- d. Stow keyboard and mouse.
- e. Power down loud speaker.
- f. Power down AN/VRC-110 radio system.
- g. Power down EPLR radio system
- h. Power down air conditioner using the following steps:

- (1) Turn selector switch to OFF.
- (2) Open CB1 Main Breaker on air conditioner front panel.
 - i. Power down PCC.
 - j. Open CBs 1 through 19 to remove all power to MTS.
 - k. Turn off light switch.
1. Secure all weather flaps for display units, impeller fans access panels, and air conditioner.

5-6. DEGRADED OPERATIONS.

Degraded shelter operations exist when one or more of the key MTS power components are inoperable or external power sources are unavailable resulting in the MTS to be powered exclusively by the on-board batteries. The key power components that affect the operational capability of the MTS are: MTS batteries, battery charger control, and power supply (inverter).

The MTS batteries act as a supplemental power source when the MTS power demand exceeds the output of the external power source. The MTS batteries also are a reserve power bank to operate the MTS without external power. The battery charger control links the HMMWV charging system to the MTS to charge on-board batteries and power MTS. The power supply (inverter) manages supplied electricity from external power sources and the MTS on-board batteries to power the MTS. In addition, the power supply (inverter) automatically switches between HMMWV DC power and generator AC power.

During degraded shelter operations, a limited number of MTS components should be operated in order to maximize amount of operational time. The equipment that should remain operational includes: one AFATDS, two monitors, ADP interface unit, lights, and communications equipment necessary to support operations. All remaining system components not deemed mission critical, should be turned off, and appropriate CB opened. These components include the air conditioner, second AFATDS computer, monitors, AFATDS printer, unnecessary communication equipment, and other items being powered by an MTS outlet.

CHAPTER 6

PREVENTIVE MAINTENANCE CHECKS AND SERVICES

6-1. PURPOSE. This chapter provides personnel with the Preventive Maintenance Checks and Services (PMCS) interval for the SHELTER EXPANDABLE (Mobile Tactical Shelter (MTS)), AN/TSQ-272, hereafter referred to as MTS or shelter, and its associated equipment/components.

6-2. SCOPE.

This chapter covers equipment installed in the MTS. The absence of an item indicates no scheduled maintenance is required. The information in Table 6-3 through Table 6-18 contain PMCS items which are exclusive to the MTS and are not covered in another Technical Manual (TM). PMCS items for the MTS which are covered in a specific TM will have the publication number or name of the PMCS procedures listed as reference.

If, at any point in the procedure, an operation cannot be performed for the desired indication or result, corrective maintenance is required. Stop and correct deficiencies before continuing with PMCS. Contact unit maintenance if the fault cannot be corrected. Before starting PMCS, review the general safety precautions in Chapter 2, which are just as important as the specific checks. Always be sure the WARNINGS and CAUTIONS seen in the PMCS procedures are understood. Keep these WARNINGS and CAUTIONS in mind while working. NOTES give information which add to or emphasize the information in the procedure.

6-3. INSPECTION.

Constant inspection, good housekeeping, and the cleanliness and order of equipment are important for satisfactory preventive maintenance. While performing PMCS, ensure items are clean and in good condition, correctly assembled or stored, securely mounted, not excessively worn or corroded, not leaking, and adequately lubricated.

Visual inspection for damage beyond safe or serviceable limits includes:

- Inspection of straps, tie downs, and cargo nets for rips, tears, and frays.
- Inspection of flexible materials for hardness, cracks, or breaks.
- Inspection for correct assembly and stowage of equipment.
- Inspection for tightness of retaining hardware. Whenever tightening is required, always tighten with the proper tool.
- Inspection for item wear or corrosion beyond serviceable limits and illegible markings, data, caution plates, and printed matter.
- Inspection for loose or chipped paint and rust discoloration.
- Inspection for gaps in weld spots or welded seams.
- Inspection of connectors for broken, bent, or missing components.
- Tighten all fittings and clamps.

6-4. SCHEDULED MAINTENANCE ACTION INDEX, TABLE COLUMN EXPLANATION.

The purpose of this section is to describe a series of inspections and performance tests which may reveal areas of trouble. These actions are intended to prevent occurrence of trouble, reduce downtime, and ensure equipment serviceability. Included are scheduled maintenance action index and preventive maintenance procedures for MTS items which are not covered in an existing TM. Refer to Table 6-1 for a sample Scheduled Maintenance Action Table.

Table 6-1. Sample Scheduled Maintenance Action Table

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Power divider	Ensure there is no damage to unit such as missing or damaged hardware or broken wires.	Refer to Chapter 7 for replacement procedures.

a. Column 1, Item Number. Column 1 numbers the checks and services to be performed in chronological order. The asterisk (*) following the item number indicates this item may also be performed during operation, if necessary.

Table 6-2. Interval Symbols Explanation

Interval	Symbol
Hourly	H
Daily	D
Weekly	W
Monthly	M
Quarterly (3 Months)	Q
Semiannually (6 Months)	S
Annually (12 Months)	A
Overhaul cycle	C
As specified (explain circumstances)	R*

b. Column 2, Interval. Table 6-2 illustrates the symbols used in Column 2 and the intervals they represent for the corresponding maintenance task. *Precede an as required (R) interval by a recommended calendar interval, e.g., Daily as Required (DR), Weekly as Required (WR), etc.

c. Column 3, Items to be Inspected. This column identifies the portion of the system to be checked or serviced.

d. Column 4, Procedure. This column provides the general procedures for performing the check and lists references for detailed procedures appearing elsewhere in this manual or lists the applicable TM.

e. Column 5, Corrective Action. This column provides corrective action if discrepancies are found when performing preventive maintenance procedures.

NOTE

Correct errors found during PMCS using the maintenance procedures and/or troubleshooting procedures found in Chapter 7.



TO AVOID SERIOUS INJURY OR DEATH, ENSURE SYSTEM IS POWERED DOWN PRIOR TO PERFORMING MAINTENANCE. USE PROPER SAFETY EQUIPMENT (SAFETY GOGGLES AND GLOVES) WHEN PERFORMING MAINTENANCE TASKS.



- Vent assemblies are crucial to ventilation and cooling of batteries, power systems, data, and voice communications systems in shelter. These vent assemblies must be free of obstructions in order to allow for free flow of air to prevent damage to equipment.
- To avoid damage to equipment, do not clean with benzene, thinner, alkaline detergent, alcoholic system detergent, glass cleaner, wax, polish cleaner, soap powder, or insecticide. Do not place rubber or vinyl against cabinet for long periods. These types of fluids and fabrics can cause paint to deteriorate, crack, or peel.
- Systems and subsystems may not be mission-capable if they do not pass maintenance requirements specified.

6-5. HIGH MOBILITY MULTI-PURPOSE WHEELED VEHICLE PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS Procedures for the High Mobility Multi-Purpose Wheeled Vehicle (HMMWV) can be found in TB 9-2320-335-13&P, TM 11033-OR, TM 11033-IN Vol 1, TM 11033-IN Vol 2, and TM 11033-INP.

6-6. LIGHTWEIGHT MULTIPURPOSE SHELTER PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS procedures and lubrication points for the Lightweight Multipurpose Shelter (LMS) can be found in TM 10-5411-235-13&P.

6-7. ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM COMPUTERS PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS procedures for the Advanced Field Artillery Tactical Data System (AFATDS) computers can be found in the Getec M230 User's Guide.

6-8. DISPLAY UNITS PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS procedures for the display units can be found in the NEC MultiSync LCD User's Manual.

6-9. POWER SUPPLY (INVERTER) AND DIGITAL DISPLAY INDICATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS procedures for the power supply (inverter) can be found in the OutBack Extreme Rugged Inverter/Charger Power Systems Installation and User Manual.

6-10. ENHANCED POSITION LOCATION AND REPORTING SYSTEM PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS procedures for the Enhanced Position Location and Reporting System (EPLRS) can be found in the TM 10901A-OR/1.

6-11. RADIO SYSTEMS PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS for the SINCGARS can be found in Publication Number 10515-0319-4500. PMCS procedures for Radio Systems can be found in TM 10901A-OR/2 or TM 11496A-OI/3.

6-12. RADIO HANDSETS PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS procedures for Radio Handset can be found in the Publication Number 10515-283-4200.

6-13. ANTENNA SYSTEMS PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS procedures for whip antenna can be found in Publication Number 10515-0011-4300. PMCS for the antenna couplers can be found in Publication Number 10515-0008-4300.

6-14. POWER CONVERTER AND CONDITIONER PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS procedures for the AFATDS Power Converter and Conditioner (PCC) can be found in Publication Number 0029-CHS3-A016-TM-1KWPCC-001A.

6-15. AIR CONDITIONER UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS procedures for air conditioner can be found in TM 11453A-OI/1.

6-16. GROUNDING KIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES PROCEDURES.

PMCS procedures for the grounding kit can be found in TM 11-5820-1118-12&P.

6-17. SCHEDULED PREVENTIVE MAINTENANCE TEST PROCEDURES

Perform PMCS to keep equipment in operating condition and find, correct, or report problems. Perform these scheduled maintenance tasks prior to operation.

NOTE

Correct discrepancies found during PMCS using maintenance procedures and/or troubleshooting procedures in Chapter 7.

Table 6-3. Shelter Exterior Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Exterior walls, floor, and ceiling panels	Inspect for evidence of punctures and delaminating. Inspect exterior surfaces for chips, scrapes, scratches, blisters, bubbles, and other problems with paint.	Ensure exterior surfaces of shelter are coated and sealed with paint to reduce possibility of rust or corrosion. If shelter has been damaged, report damage in accordance with referenced technical bulletin. If shelter is crated or pallet mounted, refer to end item technical manual for unpacking instructions.
2	M	Door and locking mechanism	Inspect for proper operation and no loose or missing hardware.	Tighten loose hardware. Replace missing hardware.
3	M	Ladder	Inspect for loose or missing hardware.	Tighten or replace hardware as needed.
4	M	Personnel door adjustment	Test by placing a piece of paper between primary and secondary doors silicone weather gasket and bearing surface on door latch side. Close and latch doors and withdraw paper. Perform this test at top, middle, and lower sections of doors. Inspect for bent, broken, or cracked metal parts that could impede functionality of primary door and latch assembly. Doors should open and close easily and latch securely. Inspect hinges for proper operation. Inspect for appropriate paint coverage and for rust or corrosion.	If there is resistance to withdrawal at each test point, sufficient seal pressure exists and no adjustments are necessary. If there is no resistance, adjustment is necessary. Notify unit maintenance.
5	M	Entry panel weather sealants on all panels.	Inspect weather sealant for cracks or damage.	Replace as necessary.
6	M	Battery compartment flaps.	Inspect for excessive wear or damage.	Replace as necessary.

Table 6-4. Shelter Interior Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Interior walls, floor, and ceiling panels.	Inspect for evidence of punctures and delaminating. Inspect interior surfaces for chips, scrapes, scratches, blisters, bubbles, and other problems with paint.	Ensure interior surfaces of shelter are coated and sealed with paint to reduce possibility of rust or corrosion. If shelter has been damaged, report damage IAW referenced technical bulletin. If shelter is crated or pallet mounted, refer to end item technical manual for unpacking instructions.
2	M	Shelter interior	Inspect for evidence of moisture/water.	Clean spills as necessary. Notify unit maintenance as needed.

Table 6-5. Power Entry Panel Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Power Entry Panel hardware	Inspect Power Entry Panel for loose, broken, or missing hardware.	Tighten loose hardware. Replace broken or missing hardware.
2	M	Power Entry Panel power connector	<p style="text-align: center;">  WARNING  TO AVOID SERIOUS INJURY OR DEATH, ENSURE SYSTEM IS POWERED DOWN PRIOR TO PERFORMING THIS PROCEDURE. Inspect for dust, dirt, or other debris that could prevent connector from making a good, reliable electrical connection. Inspect for damage that could make connector unusable or unsafe for use. </p>	If necessary, clean connector using a clean cotton cloth and isopropyl alcohol or a soft bristle brush. If broken, notify unit maintenance.
3	M	Exterior surfaces	Inspect for appropriate paint coverage and for rust or corrosion.	Ensure all surfaces are coated and sealed to reduce possibility of rust or corrosion.

Table 6-5. Power Entry Panel Preventive Maintenance Checks and Services Procedures (Continued)

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
4	M	Magnetic canvas cover	Inspect for damage and wear that could impair functionality. There should be no holes, rips, tears, or frayed canvas in cover. Cover should completely seal Power Entry Panel from damage from weather and dust.	Notify unit maintenance.

Table 6-6. Radio Frequency Power Divider Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Radio Frequency (RF) power divider	Ensure there is no obvious damage to unit such as missing or damaged hardware or broken wires.	Refer to Chapter 7 for replacement procedures.

Table 6-7. Signal Entry Panel Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Signal Entry Panel hardware	Inspect for bent, broken, cracked, or punctured metal parts that could impede functionality or structural integrity of Signal Entry Panel.	Repair or replace metal parts as necessary.
2	M	Signal Entry Panel hardware	Inspect for loose, broken, or missing hardware.	Tighten loose hardware. Replace broken or missing hardware.
3	M	Voice, data, and remote control connectors	<p style="text-align: center;">   TO AVOID SERIOUS INJURY OR DEATH, ENSURE SYSTEM IS POWERED DOWN PRIOR TO PERFORMING THIS PROCEDURE. Inspect for dust, dirt, or other debris that would prevent connector from making a good, reliable electrical/signal connection. </p>	If necessary, clean connector using a clean cotton cloth and isopropyl alcohol or a soft bristle brush.
4	M	Magnetic canvas cover	Inspect for damage and wear that could impair its functionality. There should be no holes, rips, tears, or frayed canvas in cover. Cover should completely seal Signal Entry Panel from damage from weather and dust.	Notify unit maintenance.

Table 6-8. Battery Compartment Door and Latch Assembly Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Battery compartment door and latch assembly	<p>Inspect for bent, broken, or cracked metal parts that could impede functionality of door and latch assembly. Door should open and close easily and latch securely. Inspect door hinges for proper operation.</p> <p>Inspect for appropriate paint coverage and for rust or corrosion.</p>	<p>Ensure all door assembly hardware is properly covered with sealant.</p> <p>Notify unit maintenance.</p>
2	M	Hardware	Inspect for loose, broken, or missing hardware.	Tighten loose hardware. Replace broken or missing hardware.

Table 6-9. Shelter Vent and Fan Assemblies Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Vent Assemblies	<p style="text-align: center;">WARNING</p> <p>VENT ASSEMBLIES ARE CRUCIAL TO VENTILATION AND COOLING OF BATTERIES, POWER SYSTEMS, DATA, AND VOICE COMMUNICATIONS SYSTEMS IN SHELTER. THESE VENT ASSEMBLIES MUST BE FREE OF OBSTRUCTIONS IN ORDER TO ALLOW FOR FREE FLOW OF AIR. INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT MAY OCCUR.</p> <p>Inspect for dirt and debris that could clog louvers and fans and impede their operation and efficiency.</p>	<p style="text-align: center;">WARNING</p>  <p>TO AVOID SERIOUS INJURY OR DEATH, ENSURE SYSTEM IS POWERED DOWN PRIOR TO REMOVAL OF VENT LOUVERS.</p> <p>If necessary, clean dirt, debris, or other obstructions from vent louvers or vent fans. It may be necessary to remove vent louvers to gain access to vent fans to clear obstructions from vent fan blades.</p>

Table 6-9 Shelter Vent and Fan Assemblies Preventive Maintenance Checks and Services Procedures (Continued)

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
2	M	Shelter vent assemblies	  <p>TO AVOID SERIOUS INJURY OR DEATH, ENSURE SYSTEM IS POWERED DOWN PRIOR TO REMOVAL OF VENT LOUVERS.</p> <p>Inspect for mechanical soundness and functionality. Inspect for bent, broken, or cracked metal parts that could impede functionality of vent louvers and vent fans.</p>	Replace as necessary.
3	M	Hardware	Inspect shelter vent assemblies for loose, broken, or missing hardware.	Tighten loose hardware. Replace broken or missing hardware.

Table 6-10. Radio Rack Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Radio rack	Inspect for mechanical soundness and functionality. Inspect for bent, broken, or cracked metal parts that could impede functionality of rollers and drawers.	Notify unit maintenance.
2	M	Vent fans	Inspect for dirt and debris that could impede operation and efficiency.	If necessary, clean dirt, debris, or other obstructions from rack. It may be necessary to remove drawers to gain access to vent fans to clear obstructions from vent fan blades.
3	M	Rollers, operation of shelves	Inspect for fluid motion in the operation of shelves and rollers.	Lubricate as necessary.
4	M	Radio mounts	Inspect for loose, broken, or missing hardware.	See chapter 7 for remove and replace procedures.
5	M	Hardware	Inspect radio rack for loose, broken, missing, or damaged hardware.	Repair or replace as necessary.

Table 6-11. Diplexer Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Two dippers mounted on interior curbside wall of battery compartment	Inspect for obvious signs of damage such as cracked surfaces or broken wires.	Refer to Chapter 7 for replacement procedures.

Table 6-12. Power Distribution Unit Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	PDU	Inspect for obvious signs of damage, such as broken, crimped, or burned wires and inoperative lamps or CBs.	Repair or replace as necessary. Refer to Chapter 7 for replacement procedures.

Table 6-13. Mobile Tactical Shelter Batteries Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Batteries, battery terminals, cables, and covers	<p>Inspect for cracks or leaks in battery case or corrosion on battery terminals, cables, or covers. If obvious damage exists, replace batteries.</p> <p>If corrosion exists on battery terminals or cables, follow local unit automotive battery maintenance policies and procedures for removal of battery corrosion and treatment of battery terminals and cables to prevent corrosion.</p> <div style="border: 1px solid black; padding: 2px; text-align: center;">NOTE</div> <p>Test batteries periodically in accordance with local unit policies regarding maintenance and testing of automotive batteries. See local unit guidelines and policies for testing procedures and frequency of testing.</p>	Refer to Chapter 7 for replacement procedures.

Table 6-14. Battery Charger Control Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Battery charger control	Inspect to ensure there is no obvious damage to unit such as missing or damaged hardware or broken wires.	Refer to Chapter 7 for replacement procedures.
2	M	Battery charger control remote display and control	Inspect to ensure there is no obvious damage to unit such as missing or damaged hardware or broken wires.	Refer to Chapter 7 for replacement procedures.

Table 6-15. Keyboard Display Unit Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	KDU	Inspect for obvious signs of physical damage that could imply impaired operations or catastrophic failure, including broken or damaged keypads; cracked or broken displays; or cracked, bent, punctured or broken housings.	Refer to Chapter 7 for replacement procedures.

Table 6-16. 4-Port USB Hub Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	4-port USB hub	Ensure there is no obvious damage to unit such as missing or damaged hardware or broken wires.	Refer to Chapter 7 for replacement procedures.

Table 6-17. Automated Data Processing Interface Unit Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	ADP interface unit	Inspect interface unit for obvious signs of damage such as missing or damaged hardware or broken wires.	Refer to Chapter 7 for replacement procedures.

Table 6-18. Keyboards and Mouse Devices Preventive Maintenance Checks and Services Procedures

Item No.	Interval	Items to be Inspected	Procedure	Corrective Action
1	M	Keyboards and mouse devices	Check for signs of physical damage that could impair operation.	Refer to Chapter 7 for replacement procedures.
2	M	Keyboards and mouse devices	Inspect keyboards and mouse devices for dust and dirt that could impair operation.	If needed, clean with a soft brush, vacuum cleaner, canned air, or a soft cotton cloth.

6-18. SCHEDULED TEST PROCEDURES.

Scheduled test procedures are not required for the MTS. Refer to equipment TMs for appropriate scheduled test of individual equipment.

CHAPTER 7

ALIGNMENT/MAINTENANCE PROCEDURES

7-1. INTRODUCTIONThis chapter lists troubleshooting procedures for all major components in Mobile Tactical Shelter (MTS). It provides guidance for fault isolation of MTS and supported equipment. It is divided into primary fault isolation tables and corrective maintenance. It also includes procedures for removal and replacement to the Lowest Replaceable Unit (LRU). There are no special alignment procedures for the MTS.

7-2. FAULT ISOLATION PROCEDURESThe procedures included in this section direct the user how to determine fault(s) in major systems and subsystems of MTS and how to correct most basic faults. The tables below describe basic steps for performing specific troubleshooting and corrective action required.



**TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT,
TROUBLESHOOTING MUST BE PERFORMED BY QUALIFIED PERSONNEL.**

Table 7-1. Shelter Troubleshooting

Malfunction	Test or Inspection	Corrective Action
Excessive noise and vibration	Inspect mounting hardware securing shelter to vehicle.	<ul style="list-style-type: none"> • Tighten loose hardware. • Report missing hardware to unit maintenance.
Excessive air/moisture in shelter	Inspect exterior and interior for damage.	<ul style="list-style-type: none"> • Ensure drain plug is properly seated. • Notify unit maintenance.
Personnel door binds	<ul style="list-style-type: none"> • Inspect door jamb for obstruction or dirt. • Inspect for broken door hinge or loose or missing hardware. 	<ul style="list-style-type: none"> • Clean door jamb of obstruction and debris. • Notify unit maintenance.
Personnel door does not lock	Inspect roller latch assembly for missing hardware or bent control rods.	Notify unit maintenance.
Roller latch assembly fails to secure door	Inspect roller latch assembly for missing hardware or bent control rods.	Notify unit maintenance.
Personnel door does not close tightly	Inspect EMI and weather gasket for damage.	Notify unit maintenance.
Damage to shelter floor	Inspect for proper meeting of shelter walls and floor and/or missing hardware.	Notify unit maintenance.

Troubleshooting Shelter. Shelter maintenance and repair primarily involves shelter exteriors or easily accessible interior areas. Do not operate electronic equipment when floors, ceilings, or walls show evidence of water intrusion. Refer to Table 7-1 to troubleshoot the shelter. Notify maintenance personnel if any of the following conditions exist:

- (1) Panel damage spans a structural member.
- (2) Replacement of an entire wall, ceiling, or floor is required.

(3) Damage to a structural member is severe enough to cause distortion of a wall, especially an edge or corner area.

(4) Lifting rings or corner castings are damaged severely enough to indicate possible damage to underlying structure member.

7-3. TROUBLESHOOTING POWER DISTRIBUTION SUBSYSTEM.

Table 7-2. Mobile Tactical Shelter Battery Troubleshooting

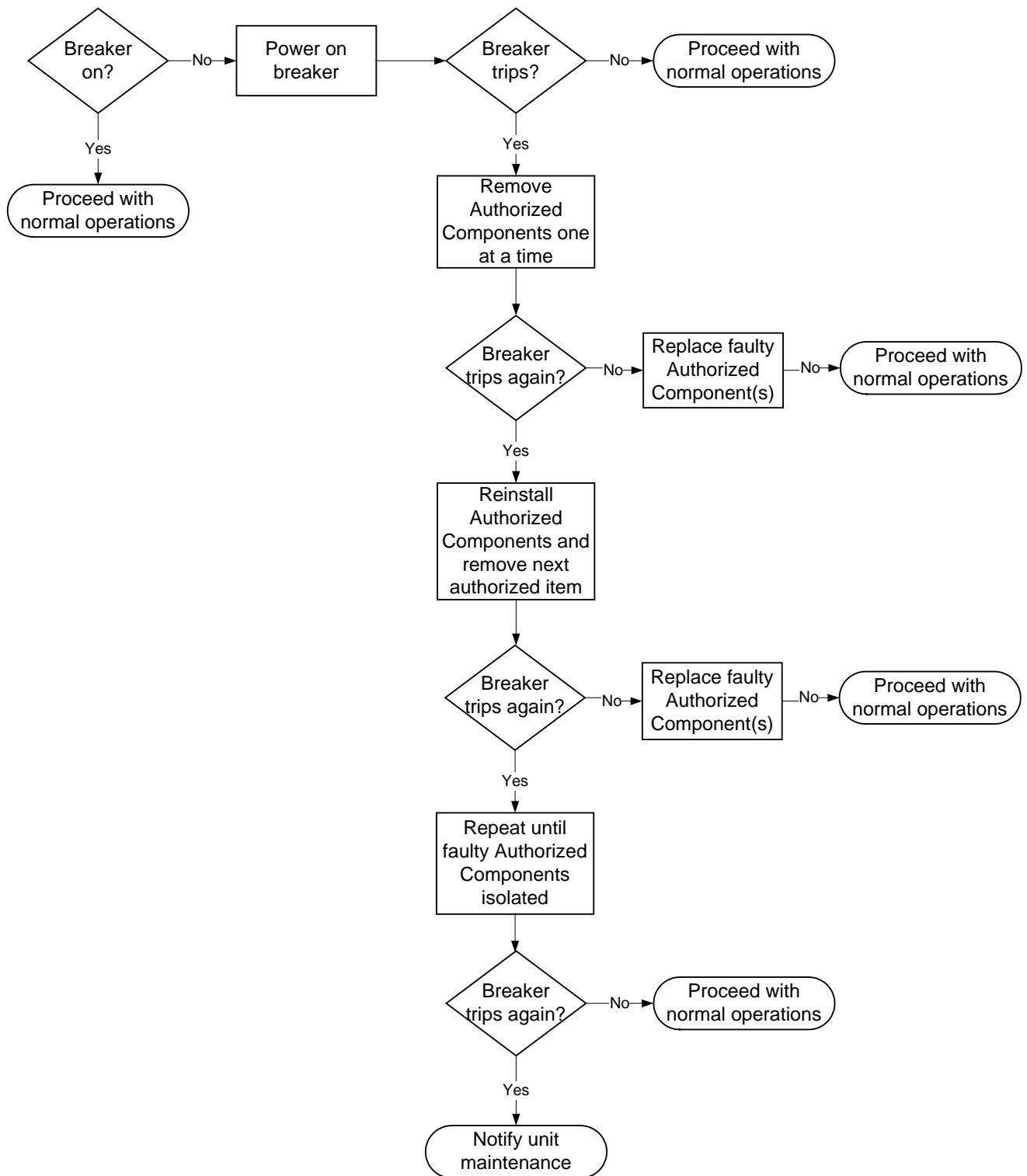
Symptom	Possible Cause	Remedy
No power to equipment	<ul style="list-style-type: none"> • Battery cables not connected. • Damaged/faulty battery. • Dead batteries. 	<ul style="list-style-type: none"> • Properly attach battery cables to terminals. • Replace batteries. • Replace batteries.

a. Troubleshooting Battery. Refer to Table 7-2 to troubleshoot batteries. Refer to paragraph 7-13 for remove and replace procedures.

b. Troubleshooting Battery Charger Control. Battery charger control is internally protected against most faults. If green light does not illuminate when power switch is held in the **ON** position, refer to the corrective maintenance procedure. Refer to paragraphs 7-14 for remove and replace procedures.

Table 7-3. Mobile Tactical Shelter Circuit Breakers

CB	Description	Function
CB-1	SOURCE OUTBACK	Main DC CB. Removes all power from shelter when open. DC source for the power supply (inverter)
CB-2	DC BUS	Removes all DC power from shelter interior when open. Power is still present at power supply (inverter).
CB-3	PCC IN-DC	DC power source for PCC.
CB-4	SINGCARS 1	Provides DC power to SINCGARS outlets, one per outlet.
CB-5	SINGCARS 2	Provides DC power to SINCGARS outlets, one per outlet.
CB-6	SINGCARS 3	Provides DC power to SINCGARS outlets, one per outlet.
CB-7	SINGCARS 4	Provides DC power to SINCGARS outlets, one per outlet.
CB-8	EPLRS 1	Provides DC power to the EPLRS 1.
CB-9	EPLRS 2	Provides DC power to the EPLRS 2.
CB-10	LIGHTS	Provides DC power to the lighting system.
CB-11	FANS	Provides DC power to the fans.
CB-12	EXT. AC INPUT	Provides AC from an external source.
CB-13	MAIN AC	Provides AC power from power supply (inverter).
CB-14	PCC IN AC	Provides AC power to PCC.
CB-15	PCC OUTLETS	Provides AC power from PCC.
CB-16	AC 1 OUTLETS	Powers AC 1 outlets in shelter.
CB-17	AC 2 OUTLETS	Powers AC 2 outlets in shelter.
CB-18	AIR COND	Powers AC to air conditioner.
CB-19	VEHICLE 24 VDC	Provides DC power from the vehicle batteries.

**Figure 7-1. Circuit Breaker Troubleshooting**

c. Troubleshooting Circuit Breakers. Refer to Table 7-3 for CB descriptions and Figure 7-1 for CB troubleshooting.

Table 7-4. Power Supply (Inverter) Troubleshooting

Symptom	Possible Cause	Remedy
Power supply (inverter) does not power up	<ul style="list-style-type: none"> • CB-1 on PDU is open. • Cables disconnected or damaged. • Damaged/faulty battery. • Failed power supply (inverter). 	<ul style="list-style-type: none"> • Close CB-1. • Reseat all cable connections. • Replace batteries. • Notify unit maintenance.
No output power from power supply (inverter)	<ul style="list-style-type: none"> • CB-13 on PDU is open. • Control wiring terminal block screws are not tight and wires are not secure. • Damaged/failed AC output power cable. • Failed power supply (inverter). 	<ul style="list-style-type: none"> • Close CB-13. • Tighten and secure terminal block screws and wires. • Notify unit maintenance. • Notify unit maintenance.

d. Troubleshooting Power Supply (Inverter). Power supply (inverter) control terminal wiring block is located on top in middle of control panel. Refer to Table 7-4 to troubleshoot the power supply (inverter). Refer to paragraph 7-15 for remove and replace procedures.

NOTE

Advancing errors (increasing count on **Debug** screen) mean digital display indicator is not finding a previously connected device. To resolve this issue, follow the steps below.

e. Troubleshooting Digital Display Indicator. Communication errors are often the result of loose, damaged, or unplugged cables. They can also occur if Advanced Generator Start (AGS) mode is used and wrong port is designated for generator, or if system is damaged by a lightning strike. When a communication error occurs, a “**COMM ERR**” message appears. Refer to OutBack Extreme Rugged Inverter/Charger Power Systems Installation and User Manual.

NOTE

The power supply inverter is operational in this configuration which allows mission to continue until maintenance/ repair actions can be performed at a depot.

(1) Verify power supply (inverter) Direct Current (DC) breaker is closed and operating correctly, inverter is powered on, and Category (Cat) 5 cable connecting inverter to hub is plugged in at both ends.

(2) If available, swap digital display indicator with a known good digital display indicator, each using its own Cat 5 cable. Recheck system and check for errors on each port. If error moved, problem is with cable between port and digital display indicator. If error remains on same port, problem is with digital display indicator. Refer to paragraph 7-15 for remove and replace procedures.

Table 7-5. Advanced Field Artillery Tactical Data System Power Conditioner/Converter Troubleshooting

Symptom	Possible Cause	Remedy
AFATDS PCC will not power on from AC or external DC	<ul style="list-style-type: none"> AFATDS PCC On/Off switches set to OFF. Verify circuit breakers (CB-1, CB-2, CB-3, CB-13, and CB-14) on PDU pushed in properly. AC and/or DC input power problem. 	<ul style="list-style-type: none"> Set On/Off switches on AFATDS PCC front panel to ON. Push in circuit breaker (CB-1, CB-2, CB-3, CB-13, and CB-14). Notify unit maintenance.
No output power from AFATDS PCC	<ul style="list-style-type: none"> Damaged/failed AC output power cable. Failed AFATDS PCC. 	<ul style="list-style-type: none"> Notify unit maintenance. Notify unit maintenance.
AFATDS PCC Alarm sounds	<ul style="list-style-type: none"> Excessive output load on AFATDS PCC. AC and/or DC input power source failed. AFATDS PCC temperature exceeded internal temperature limit. 	<ul style="list-style-type: none"> Reduce output load on PCC. Restore external power source. Allow AFATDS PCC to cool and remove any external items restricting airflow. Notify unit maintenance.
AFATDS PCC not powering output load when powered from external AC or DC source	<ul style="list-style-type: none"> Excessive output load on AFATDS PCC. AFATDS PCC failed. 	<ul style="list-style-type: none"> Reduce output load on AFATDS PCC. Notify unit maintenance.

f. Troubleshooting Power Conditioner/Converter. Refer to Table 7-5 to troubleshoot the AFATDS PCC. Refer to paragraph 7-17 for remove and replace procedures. Refer to TM 0029-CHS3-A016 TM-1KWPCC-001A for complete fault isolation procedures.

Table 7-6. Antenna Mast/Mount Troubleshooting

Symptom	Possible Cause	Remedy
No data/radio transmission	<ul style="list-style-type: none"> Antenna/mount base damaged. Lose antenna or section. Antenna not installed. Failed antenna/mount base. 	<ul style="list-style-type: none"> Replace antenna/mount base. Tighten antenna or section. Install antenna whip. Replace antenna/mount base. Notify unit maintenance.

g. Troubleshooting Antennas. Refer to Table 7-6 to troubleshoot the antennas. Refer to paragraph 7-7 for remove and replace procedures.

7-4. TROUBLESHOOTING ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM.

a. Troubleshooting Network. Operate on-board data network equipment to ensure system is operational. Verify proper network connectivity to all nodes and that data traffic is moving across network by sending and receiving data from computers from secure and non-secure networks. Operate AFATDS, send tactical data to Combat Operations Center (COC), and confirm receipt. Operate computer systems, confirm network connectivity, and verify that computer systems are passing data and working correctly as network nodes.

b. Troubleshooting EPLRS. Ensure Enhanced Position Location and Reporting System (EPLRS) radio system is transmitting location data to COC. If COC is not receiving position locating signal or data, troubleshoot EPLRS using TM 11-5825-299-10. Check cable and wiring connectivity issues and antenna functionality using EPLRS TM 11-5825-299-10. Refer to TM 10901A-OR/2 for complete fault isolation procedures. Refer to paragraph 7-18 for remove and replace procedures.

Table 7-7. AN/VRC 110 System Troubleshooting

Symptom	Possible Cause	Remedy
No power indication	<ul style="list-style-type: none"> • Power is not switched to ON position. • Circuit breakers (PDU) are not pushed in properly (CB-1, CB-2, CB-4, CB-5, CB-6, and CB-7). • Amplifiers not seated properly in shock mount. • SINCGARS power cable not fitted correctly. 	<ul style="list-style-type: none"> • Toggle power switch located on amplifier to the ON position. • Push in circuit breaker (CB-1, CB-2, CB-4, CB-5, CB-6, and CB-7). • Re-seat amplifiers in shock mount. • Properly plug in SINCGARS power cable to shock mount. • Notify unit maintenance.
No data transmission	<ul style="list-style-type: none"> • Radios not seated properly in amplifier and data cables and/or disconnected. • Radio cables and antenna disconnected/mounted improperly. • Radio not configured properly to transmit/receive data. 	<ul style="list-style-type: none"> • Reseat radios and properly secure data cables to side of 110 radio. • Attach radio cables and mount antenna to shelter/base. • Configure radio(s) to correct settings (channel data/frequency). • Notify unit maintenance.

c. AN/VRC-110 Radio System. Operate Single Channel Ground-to-Air Radio System (SINCGARS) AN/VRC-110 vehicular radio system, including AN/PRC-152 Receiver/Transmitters (R/Ts) IAW AN/VRC-110 (and AN/PRC-152) TM 11496A-OI/3. Refer to TM 11-5825-299-10 to verify cable and wiring connectivity, antenna functionality, troubleshooting, or removal and replacement of radio system. Refer to Table 7-7 to troubleshoot the AN/VRC 110 radio system. Perform the following turn-on procedure to troubleshoot the AN/VRC-110.

(1) Maintenance Turn-on Procedure. Maintenance turn-on procedure guides the user through proper settings to power up radio from de-energized state to fully-operational state. Observe radio for normal operating conditions. Faults may be determined by using Built-in Test (BIT) or visual observation.

NOTE

On some models, selection reads **FP** instead of **F**.

- (a) Turn on radio by rotating cipher switch to **PT** or **CT** and turn function knob to **F**.
- (b) Place Vehicle Amplifier Adapter (VAA) power switch to ON position. If radio does not power up, verify power source is on.
- (c) Radio completes Power-On Self-Test (POST); proceed to step (2) for operator-initiated BIT troubleshooting. If radio fails POST, refer to Publication Number 10515-0359-4200 for additional details on troubleshooting radio system.
- (d) Press **OPT**.
- (e) Use up/down arrow buttons to select **Test Options**.

NOTE

While in **TEST** mode, radio cannot receive or transmit.

- (f) Press **ENT**.
- (2) To perform operator-initiated BIT, select **SELF TEST** and press **ENT**. Operator-initiated BIT performs longer tests in addition to running data/loopback tests through crypto. Refer to Publication Number 10515-0359-4200 for additional details on troubleshooting radio system.

Table 7-8. Computer Troubleshooting

Symptom	Possible Cause	Remedy
Peripheral devices not operational (keyboard, mouse, printer, ADP switch, 4-port USB hub, hard drive, display)	<ul style="list-style-type: none"> • Devices not turned on. • Cable connections loose or disconnected. • Devices are incorrectly installed. • Device failure. 	<ul style="list-style-type: none"> • Turn on devices. • Ensure all connections are secure. • Ensure all devices are installed properly. • Remove and replace device.

- d. Troubleshooting Computers. Operate computer to ensure systems are functioning properly. Refer to the AFATDS Computer User's Manual to verify cable and wiring connectivity, troubleshooting, or removal and replacement of computer system. Refer to Table 7-8 for troubleshooting. Refer to paragraph 7-24 for remove and replace procedures.

Table 7-9. Display Unit Troubleshooting

Symptom	Possible Cause	Remedy
No picture/video	<ul style="list-style-type: none"> • Power not switched to ON position • Signal cable not connected to computer/display. • Signal cable connector damaged. • Signal input not set to display correct input. • Incorrect computer display settings. • Front LED is blinking amber. 	<ul style="list-style-type: none"> • Toggle power switch located on display and computer to ON position. • Verify/connect signal cable to computer/display. • Notify unit maintenance. • Switch display to proper input and check status of Images Per Minute (IPM) mode. • Change computer output display settings. • Verify computer is not in power-save mode. • Notify unit maintenance.
No power	<ul style="list-style-type: none"> • Power switch not in ON position. • Circuit breakers (CB-16 and CB-17) on the PDU are not pushed in properly. • Power button does not respond. • Display AC power cable damaged. 	<ul style="list-style-type: none"> • Toggle power switch located on display and computer to ON position. • Push in circuit breaker (CB-16 and CB-17). • Unplug display unit power cord from AC outlet to reset display unit. • Notify unit maintenance.
Image unstable or unfocused	Signal cable not properly connected.	<ul style="list-style-type: none"> • Verify/connect signal cable to computer/display. • Use On Screen Menu (OSM) controls to focus and adjust display. • Notify unit maintenance.
Text garbled on display	Improper refresh rate	Change video mode from non-interlaced to 60 Hz refresh rate.
Display image not sized properly	Images display at incorrect size	<ul style="list-style-type: none"> • Use OSM controls to increase or decrease coarse total • Ensure supported mode has been selected on display card or system • Notify unit maintenance

Table 7-9. Display Unit Troubleshooting (Continued)

Symptom	Possible Cause	Remedy
No video output	<ul style="list-style-type: none"> • VGA cables not plugged in properly. • Failed RF power divider. • Failed RF power divider power supply. 	<ul style="list-style-type: none"> • Reseat all cable connections. • Notify unit maintenance. • Notify unit maintenance.

e. Troubleshooting Display Units and RF Power Dividers. MTS display units are equipped with the ability to self diagnose abnormalities. When display unit detects a problem, the Light Emitting Diode (LED) on front flashes in a pattern of long and short blinks, depending on problem detected. Refer to Table 7-9 to troubleshoot display units. Refer to paragraph 7-25 for remove and replace display units. Refer to paragraph 7-26 for remove and replace RF power dividers. Refer to NEC MultiSync LCD User's Manual for complete fault isolation.

Table 7-10. Lighting Troubleshooting

Symptom	Possible Cause	Remedy
No light/power	<ul style="list-style-type: none"> • Power is not switched to white, red, or door select light position. • Power cable(s) damaged. • LED lights faulty. • Circuit breakers (PDU) are not pushed in properly (CB10). • Relay, electromagnetic faulty. 	<ul style="list-style-type: none"> • Toggle power switch to white, red, or door select light position. • Notify unit maintenance. • Notify unit maintenance. • Push in circuit breaker (CB10). • Notify unit maintenance.

f. Troubleshooting Lighting. Ensure overhead lights are on and working properly. Ensure blackout light function is operational by opening and closing personnel door during operation. Refer to Table 7-10 to troubleshoot the lighting. Refer to paragraph 7-10 for remove and replace procedures.

Table 7-11. Handset Troubleshooting

Symptom	Possible Cause	Remedy
Cannot hear or talk	<ul style="list-style-type: none"> • Handset not connected. • Failed handset. 	<ul style="list-style-type: none"> • Connect handset to speaker or radio. • Notify unit maintenance.

g. Troubleshooting Handset. Refer to Table 7-11 to troubleshoot handset.

Table 7-12. Keyboard Display Unit (KDU) Troubleshooting

Symptom	Possible Cause	Remedy
No power/display on unit	<ul style="list-style-type: none"> • Cables not connected. • Radio not on. • KDU not enabled. • Failed KDU. 	<ul style="list-style-type: none"> • Reseat all cable connections. • Turn PRC152 on. • Enable KDU settings in PRC152 in radios option settings. • Notify unit maintenance.

h. Troubleshooting Keyboard Display Unit. Refer to Table 7-12 to troubleshoot KDU. Refer to paragraph 7-16 for remove and replace procedures.

Table 7-13. Loud Speaker Troubleshooting

Symptom	Possible Cause	Remedy
No audio	<ul style="list-style-type: none"> • Loud speaker turned off. • Cables disconnected or damaged. • Volume turned down too low. • Failed speaker. 	<ul style="list-style-type: none"> • Toggle power to ON position. • Reseat all cable connections. • Twist volume knob to increase volume. • Notify unit maintenance.

i. Troubleshooting Loudspeaker. Refer to Table 7-13 to troubleshoot speakers. Refer to paragraph 7-21 for remove and replace procedures.

Table 7-14. ADP Interface Unit Troubleshooting

Symptom	Possible Cause	Remedy
ADP interface unit does not power up.	<ul style="list-style-type: none"> • Circuit breakers (PDU) are not pushed in properly. (CB16 and CB17). • Power cable disconnected or damaged. • Failed ADP interface unit. • PCC not powered on. 	<ul style="list-style-type: none"> • Push in circuit breaker. (CB16 and CB17). • Reseat power cable connection. • Refer to paragraph 7-24 for replacement. • Power on PCC
No data from ADP interface unit.	<ul style="list-style-type: none"> • Cat -5 cable(s) disconnected or damaged. • Failed ADP interface unit. 	<ul style="list-style-type: none"> • Reseat Cat-5 cable connections. Inspect for damage. • Refer to paragraph 7-24 for replacement.

j. Troubleshooting ADP Interface Unit. Refer to Table 7-14 to troubleshoot ADP interface unit. Refer to paragraph 7-23 for remove and replace procedures.

7-5. TROUBLESHOOTING AIR CONDITIONER AND VENTILATION FANS.

Table 7-15. Air Conditioner Troubleshooting

Symptom	Possible Cause	Remedy
Air conditioner fails to start	<ul style="list-style-type: none"> • Incorrect voltage. • Power failure. • Correct power connection not selected. 	<ul style="list-style-type: none"> • Correct voltage. • Check power source, power input, and circuit breaker. • Check control cables and connections. • Adjust to proper temperature setting.
Air conditioner fails to cool/heat	<ul style="list-style-type: none"> • Improper temperature control. 	<ul style="list-style-type: none"> • Adjust to proper temperature setting. • Contact unit maintenance.

a. Troubleshooting Air Conditioner. Ensure air conditioner is operating properly. Refer to Table 7-15 to troubleshoot air conditioner. If air conditioner is not operating properly, refer to paragraph 7-8 for remove and replace procedures for air conditioner.

Table 7-16. Ventilation Fan Troubleshooting

Symptom	Possible Cause	Remedy
No power/low airflow	<ul style="list-style-type: none"> • Circuit breaker (CB-11) on PDU not pushed in correctly. • Loose or damaged cable. • Failed fan. 	<ul style="list-style-type: none"> • Push in circuit breaker (CB-11). • Check wiring for proper connection and damage. • Notify unit maintenance.

b. Troubleshooting Ventilation Fans. Ensure ventilation fans are operating properly. Refer to Table 7-16 to troubleshoot fans. If ventilation fans are not operating properly, refer to paragraph 0 for ventilation fan removal and replacement.

7-6. CORRECTIVE MAINTENANCE.

Corrective maintenance at Organizational (O) level (1st and 2nd echelon maintenance) consists of removal and replacement of Lowest Replaceable Units (LRUs), cables, and LRU installation hardware.

a. Special Tools and Support Equipment. No special tools or test equipment are required to repair shelter. TM 10-5411-235-13&P lists standard tools and test equipment needed for maintenance and repairs of shelter only.

b. Repair Parts. Refer to parts list in TM 10-5411-235-13&P for authorized repair parts used in repair of shelter only. This list does not include parts for shelter furniture, equipment racks, equipment housed within shelter, or antenna systems or other ancillary equipment mounted on exterior of shelter.

7-7. REMOVE AND REPLACE ANTENNA AND ANTENNA BRACKET.

TOOLS: Screwdriver, Cross-tip, #2

 Socket, Drive 1/2 inch

 Ratchet, Drive, 3/8 inch

 Putty knife, Standard

 Socket, Drive 7/16 inch

MATERIALS/PARTS: Antenna, EPLRS (Figure 8-1, Item 1)

 Antenna, SINCGARS (Figure 8-2, Item 1)

 Bracket, mount cover (Figure 8-1, Item 5 and Figure 8-2, Item 5)

 Cloth, cotton, muslin (Appendix B, Item 21)

 Isopropyl Alcohol, Technical (Appendix B, Item 3)

 Sealing compound, polysulfide (Appendix B, Item 7)

 Washers, lock (Figure 8-1, Item 3 and Figure 8-2, Item 3)

SAFETY EQUIPMENT: Goggles, industrial (Appendix B, Item 17)

 Gloves, Chemical and Oil Protective (Appendix B, Item 19)

PERSONNEL REQUIRED: Two

MOS: Personnel for initial examination: 0844, 0848, or 0861.

 Personnel for base replacement: 2841.

WARNING

TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.

NOTE

- Refer to TM 11-5825-299-10 and Publication Number 10515-0359-4200 for more detailed information on system operation, maintenance, troubleshooting, and repair.
- This section contains a general description of removal and replacement procedures for the EPLRS and SINCGARs radio antenna systems that attach to MTS. The mounts are slightly different in the two antenna systems.

a. Remove Antenna Base

- (1) Remove antenna mast from antenna base.
- (2) Disconnect Radio Frequency (RF) line from base bottom by rotating connector nut counter-clockwise.
- (3) Using a #2 cross-tip screwdriver, remove ground wire.
- (4) Using a 1/2 inch socket with 3/8 inch drive ratchet, remove four 5/16 inch-18 x 1-1/4 inch hex cap bolts, four 5/16 inch lock washers, and four 5/16 inch x 11/16 inch flat washers. Retain hardware. Discard lock washers.
- (5) Remove antenna and antenna base from antenna mounting bracket and set aside.

b. Remove Antenna Mounting Bracket

- (1) With a putty knife, scrape away polysulfide sealant around perimeter of antenna mounting bracket.
- (2) Using a 7/16 inch socket with 3/8 inch drive ratchet, remove 1/4 inch-20 x 3/4 inch (GR8) bolts, flat washers, and lock washers securing antenna mounting bracket from shelter wall. Retain hardware. Discard lock washers.
- (3) Carefully remove antenna mounting bracket from wall and set aside.

WARNING

ALCOHOL SOLVENTS ARE FLAMMABLE. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME. KEEP CONTAINERS CLOSED WHEN NOT IN USE. USE ONLY IN WELL-VENTILATED AREAS. AVOID PROLONGED BREATHING OF VAPORS OR REPEATED CONTACT WITH SKIN.

(4) With clean cotton cloth and isopropyl alcohol, clean shelter surface area under antenna mounting bracket.

c. Replace Antenna and Mounting Bracket

(1) Position new antenna mounting bracket on the shelter. Ensure mounting holes in shelter wall align with holes in antenna mounting bracket.

(2) Using a 7/16 inch drive socket with 3/8 inch drive ratchet, install 1/4 inch-20 x 3/4 inch (GR8) bolts, flat washers, and new lock washers into holes in antenna mounting bracket and tighten securely.

(3) Place new antenna base on bracket placing ID plate towards outside.

(4) Using a 1/2 inch socket with 3/8 inch drive ratchet, insert four 5/16 -18 x 1-1/4 inch hex cap bolts, four 5/16 inch lock washers, and four 5/16 inch x 11/16 inch flat washers.

(5) Using a #2 cross-tip screwdriver, insert pan head cross-recessed #10-32 x 3/8 inch screw, attach unfastened end of antenna ground wire to base of antenna base assembly.

(6) Reattach antenna coaxial cable and tighten securely.

WARNING

TO PREVENT INJURY TO PERSONNEL, CHEMICAL PROTECTIVE GLOVES MUST BE WORN WHEN WORKING WITH SEALING COMPOUND, POLYSULFIDE. INJURY TO PERSONNEL MAY RESULT IF CHEMICALS CONTACT UNPROTECTED SKIN. SMOKING IS PROHIBITED WHEN WORKING WITH FLAMMABLE MATERIALS.

(7) Apply polysulfide sealant around perimeter of antenna mounting bracket.

(8) Once base is properly attached, reattach the antenna mast to base.

7-8. REMOVE AND REPLACE AIR CONDITIONER.

TOOLS: Socket, Drive, 7/16 inch
Ratchet, Drive, 3/8 inch
Wrench, 7/16 inch (Qty 2)
Socket, Drive, 9/16 inch
Putty knife, Standard

MATERIALS/PARTS: Adhesive (Appendix B, Item 2)
 Adhesive (Appendix B, Item 23)
 Air conditioner (Figure 8-10, Item 4; Figure 8-11, Item 9)
 Cloth, cotton, muslin (Appendix B, Item 21)
 Isopropyl Alcohol, Technical (Appendix B, Item 3)
 Sealing Compound (Appendix B, Item 7)
 Sealing Compound (Appendix B, Item 22)
 Soap, lubricating (Appendix B, Item 24)
 Washer, lock (Figure 8-10, Item 2; Figure 8-11, Item 3)

SAFETY EQUIPMENT: Gloves, chemical and oil protective (Appendix B, Item 19)

PERSONNEL REQUIRED: Four

MOS: Personnel for initial examination: 0861.
 Personnel for troubleshooting and replacement: 0844 or 0848.

a. Remove

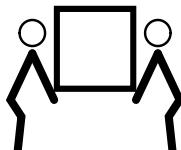


TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.

NOTE

Before performing this procedure, ensure that the air conditioner power cable is unplugged from the air conditioner inside the shelter.

- (1) Using a 7/16 inch socket with 3/8 inch drive ratchet, remove 16 1/4 inch-20 x 1 inch hex cap screws, 16 1/4 inch split lock washers and 1/4 inch x 5/8 inch flat washers that are threaded through the bracket into the shelter wall and air conditioner shelf.
- (2) The two screws inserted into the air conditioner shelf are held in place via a 1/4-20 nut on the other side. Using a 7/16 inch socket with 3/8 inch drive ratchet, loosen the nuts. An additional 7/16 inch wrench is needed for the two bottom screws.
- (3) Lift rain guard bracket from air conditioner. Retain bracket and hardware.
- (4) On underside of shelf, use a 9/16 inch socket and 3/8 inch drive ratchet to remove four 3/8-24 x 1-1/2 inch hex head bolts (GR8), four 3/8 inch x 7/16 inch flat washers (GR8), and four 3/8 inch lock washers (GR8). Retain hardware for installation. Discard lock washers.



- **TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, AIR CONDITIONER IS A MANDATORY 4-MAN LIFT. IF FOUR MALE PERSONNEL ARE NOT AVAILABLE, AIR CONDITIONER MUST BE MOVED WITH MECHANICAL LIFT TO AVOID INJURY TO PERSONNEL.**
- **TO PREVENT INJURY TO PERSONNEL, CHEMICAL PROTECTIVE GLOVES MUST BE WORN WHEN WORKING WITH SEALING COMPOUND, POLYSULFIDE. INJURY TO PERSONNEL MAY RESULT IF CHEMICALS CONTACT UNPROTECTED SKIN. SMOKING IS PROHIBITED WHEN WORKING WITH FLAMMABLE MATERIALS.**

NOTE

Air conditioner may require a rocking motion to free it.

- (5) Slide air conditioner backwards from shelter wall.
- (6) Lift air conditioner from air conditioner mounting bracket and lower to ground.

NOTE

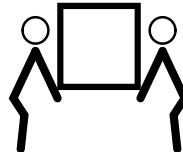
Air conditioner bezel gasket should be inspected and replaced, if required. When replacing gasket apply sealing compound, polysulfide between the gasket and the air conditioner.

- (7) Once air conditioner is removed, inspect gasket for any holes, tearing and/or damage. Replace as necessary. If required, peel old gasket from bezel opening. Sections may require the use of a putty knife to separate the material from bezel surface.

- (8) Inspect foam weather seal on rain guard and remove if damaged.

b. Replace

- (1) If required, obtain 85 inches of self-sticking gasket seal to fit air conditioner bezel perimeter.
- (2) Cut four pieces, two 24 1/4 inch and two 16 1/4 inch pieces with a 45 degree cut on the ends, so when mated together form a 90 degree bend in corners.
- (3) Peel off wrapping and press gasket into place in bezel. Placement should be 1/4 inch inside outer rim of bezel with joining ends centered along bottom bezel lip.



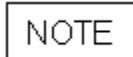
- **TO PREVENT INJURY TO PERSONNEL, CHEMICAL PROTECTIVE GLOVES MUST BE WORN WHEN WORKING WITH SEALING COMPOUND, POLYSULFIDE. INJURY TO PERSONNEL MAY RESULT IF CHEMICALS CONTACT UNPROTECTED SKIN. SMOKING IS PROHIBITED WHEN WORKING WITH FLAMMABLE MATERIALS.**
- **TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, AIR CONDITIONER IS A MANDATORY 4-MAN LIFT. IF FOUR MALE PERSONNEL ARE NOT AVAILABLE, AIR CONDITIONER MUST BE MOVED WITH MECHANICAL LIFT TO AVOID INJURY TO PERSONNEL.**

(4) Seal the mating area between the self-sticking gasket seal and bezel, exterior only, using multi-purpose polyurethane sealant adhesive.

(5) Using a 4-man lift, place air conditioner on support shelf and align fastener holes through access holes in shelf.

(6) Seat the air conditioner onto the bottom rain guard and against air conditioner opening gasket and line up with mounting holes in the air conditioner platform. Considerable pressure may be needed to line up fastener hole.

(7) Using a 9/16 inch socket and 3/8 inch drive ratchet, install, but do not tighten, four 3/8-24 x 1-1/2 inch hex head bolt (GR8), four 3/8 x 7/8 inch flat washers (GR8) and four 3/8 inch medium split lock washers (GR8) through shelf mount holes into threaded mounting hole on bottom of air conditioner.



Do not reuse lock washers. Always replace lock washers with new ones.

- (8) Align the face of air conditioner in bezel opening, ensure it sits flush with gasket.
- (9) Ensure air conditioner is centered over the skid plates.
- (10) Using a 9/16 inch socket and 3/8 inch drive ratchet, tighten hardware.
- (11) Replace foam weather seal on rain guard, if necessary.

CAUTION

- To prevent damage to equipment, do not over-tighten bracket against shelter wall.
- To prevent damage to equipment, do not install adhesive in temperatures above 80 degrees F.
- To prevent damage to equipment, maintain a distance of .41 inches (13/32 inches) between the rain guard and the shelter wall.

(12) Reinstall rain guard bracket using the following steps:

NOTE

Bracket is an extremely tight fit and may require some side to side movement to move it into position. It may also require a mild liquid soap to lubricate gasket.

- (a) Position rain guard bracket over air conditioner and push downward until guard is seated flush with shelf bracket and forward wall of shelter. Maintain a .41 inch (13/32 inch) distance between the rain guard and shelter.
- (b) Using a 7/16 inch socket with a 3/8 inch drive ratchet and a 7/16 inch wrench, secure rain guard to shelf bracket with two 1/4 inch-20 x 1 inch hex cap screws, two 1/4 inch medium split lock washers, two 1/4 inch x 5/8 inch flat washers. Rain guard must be pulled down with bottom screws to align the 14 front wall fastener holes. Do not fully tighten bottom fasteners.
- (c) Once forward holes are aligned by downward pressure, install 14 1/4 inch-20 x 1 inch hex cap screws, 14 1/4 inch medium split lock washers, and 14 1/4 inch x 5/8 inch flat washers.
- (d) Using a 7/16 inch socket and 3/8 inch drive ratchet, tighten hardware using a “star” pattern.
- (e) Return to bottom fasteners and, using a 7/16 inch socket and 3/8 inch drive ratchet with a 7/16 inch wrench, fully tighten.

WARNING



TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.

7-9. REMOVE AND REPLACE FAN ASSEMBLIES.

TOOLS: Wire cutters
Screwdriver, Cross-tip, #2
Ratchet, Drive, 1/4 inch
Socket, Drive, 11/32 inch
Wrench, 3/8 inch
Wrench, 11/32 inch

MATERIALS/PARTS: Lock nut, nylon insert (Figure 8-6, Item 7)
 Nut, self-locking (Figure 8-8, Item 1)
 Strap, tiedown, electrical components (Appendix B, Item 8)
 Ventilation fan (Figure 8-8, Item 5)

MOS: Personnel for initial examination: 0844, 0848, or 0861.
 Personnel for replacement: 1141.

a. Remove and Replace Battery Door Fans

NOTE

Due to the harsh environment in which these fans operate, they require periodic replacement.

(1) Remove

- (a) Open CB-11 to remove power from fan circuit.
- (b) Open battery door to gain access to both sides of fan fastener screws and power connector.
- (c) Disconnect the Conex twistlock connector (W55-3 or W55-4) and, using wire cutters, cut any cable ties holding the fan wire in place.
- (d) Using a #2 cross-tip screwdriver and a 1/4 inch drive ratchet with an 11/32 inch socket, loosen hardware and remove the four #8 32 x 1-1/4 inch pan head cross-recessed screws, eight #8 flat washers, four #8 spacers, and four #8 nylon insert locking nuts. Screw heads will be to the outside of the door with nylon insert locking nuts on the inside.
- (e) Remove the fan assembly.

(2) Replace

NOTE

- Do not reuse nylon insert locking nuts. Always replace with new ones.
- If new fan assembly does not come with a fan guard attached, the user can reuse the guard from the old fan.

(a) Use the following procedure to reuse the guard from the old fan:

1 Using a #2 cross-tip screwdriver, 1/4 inch drive ratchet with 11/32 inch socket, remove the axial fan guard (PN 4C657) from original fan assembly by removing four #8-32 x 5/8 inch pan head cross-recessed screws and eight #8 x 3/8 inch flat washers, four #8 hex plain nuts.

2 Using a #2 cross-tip screwdriver, 1/4 inch drive ratchet with 11/32 inch socket, install axial fan guard assembly onto new fan assembly using eight #8-32 x 5/8 inch pan head cross-recessed screws and eight #8 x 3/8 inch flat washers, four #8 hex plain nuts.

(b) Center new fan assembly over door vent bezel and vent holes.

(c) Position fan assembly, ensuring that wiring is in the bottom right hand corner, and airflow indicator is oriented to exhaust from battery compartment.

(d) Secure using four #8 32 x 1-1/4 inch pan head cross-recessed screws, four #8 flat washers, four #8 spacers, and four #8 nylon insert locking nuts. Screw heads will be to the outside of the fan with nylon insert locking nuts on the inside.

(e) Using a #2 cross-tip screwdriver and a 1/4 inch drive ratchet with 11/32 inch socket tighten the hardware.

(f) Reconnect the Conex twistlock connector (W55-3 or W55-4) to DC source and cable tie wire to appropriate tie mount.

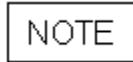
(g) Repeat steps (a) through (f) for replacement of second fan assembly, if necessary.



TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.

b. Remove and Replace Radio Rack Computer Cooling Fan

(1) Remove



- The two cooling fans are located behind the computer shelves on the radio rack.
- The fans are attached to the left rear leg via a fan bracket. In the event that one of the fans needs replacing, it is much easier to remove the entire assembly from the leg and replace the fan on the bracket.

(a) Open CB-11 to remove power from fan circuit.

WARNING



TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT, CONFIRM THAT POWER IS REMOVED BEFORE SLIDING OUT RADIO SHELVES.

- (b) Pull out the radio shelf in the radio rack to the outward lock position. Pull out both computer shelves. This creates the space necessary for removal of both fan brackets.
- (c) Disconnect the Conexall connector (W55-5 or W55-6) on rear face of fan and allow DC supply cable harness to hang in place.
- (d) Using a #2 cross-tip screwdriver, 1/4 inch drive ratchet with 11/32 inch socket , remove the two 1/4 inch-20 x 3/4 inch hex head cap screws, four #1/4 inch x 5/8 inch flat washers, and two 1/4 inch-20 nylon insert locking lock nuts.
- (e) Remove fan assembly from radio rack.
- (f) Using a #2 cross-tip screwdriver, 1/4 inch drive ratchet with 11/32 inch socket remove fan from bracket by removing four #8-32 x 3/4 inch pan head cross-recessed screws, eight #8 x 3/8 inch flat washers, and four #8 32 nylon insert locking lock nuts.

(2) Replace

NOTE

If new fan assembly does not come with a fan guard attached, the user can reuse the guard from the old fan.

- (a) Use the following procedure to reuse the guard from the old fan:
 - 1 Using a #2 cross-tip screwdriver, 1/4 inch drive ratchet with 11/32 inch socket, remove the axial fan guard from original fan assembly by removing four #8-32 x 5/8 inch pan head cross-recessed screws and eight #8 x 3/8 inch flat washers, four #8 hex plain nuts.
 - 2 Using a #2 cross-tip screwdriver, 1/4 inch drive ratchet with 11/32 inch socket, install axial fan guard assembly onto new fan assembly using eight #8-32 x 5/8 inch pan head cross-recessed screws and eight #8 x 3/8 inch flat washers, four #8 hex plain nuts.
- (b) Using a #2 cross-tip screwdriver, 1/4 inch drive ratchet with 11/32 inch socket, attach grill to replacement fan using four #8-32 x 5/8 inch pan head cross-recessed screws, eight #8 x 3/8 inch flat washers, and four #8 hex plain nuts.
- (c) Assemble fan housing between grill and bracket.
- (d) Orient grill so it stands away from fan housing.
- (e) Orient bracket so angled section bends toward grill.
- (f) Orient fan so air is forced through grill. (Air flow is indicated by an arrow on fan housing.) Ensure fan wires are fed into channel and cannot interfere with spinning blades during operation.

(g) Using a #2 cross-tip screwdriver, 1/4 inch drive ratchet with 11/32 inch socket, fasten fan to bracket using four #8-32 x 3/4 inch pan head cross-recessed screws, eight #8 x 3/8 inch flat washers, and four #8-32 Nylon insert locking lock nuts.

(h) Position cable tie mount on rear of bracket and install mounting hardware through mount as fan is installed on bracket.

(i) Secure connector to cable tie mount using 7-inch cable tie.

(j) Using a #2 cross-tip screwdriver and 3/8 inch wrench, tighten hardware.

(k) Mount fan assembly to rear left radio rack leg, between the third and fourth shelves (counting from top).

(l) Use two 1/4 inch-20 x 3/4 inch hex head cross-recessed screws, four #1/4 inch x 5/8 inch flat washers, and two 1/4 inch-20 nylon insert locking nuts. Adjust fan assembly vertically as needed.

NOTE

Ensure fan assembly does not interfere with shelf movement when computer is mounted.

(m) Reconnect fan wire harness to the connector cable-tied to rear of grill fastener hole.

(n) Ensure that connector is on upper left rear corner of bracket.

c. Remove and Replace Rear Door Vent Fans

WARNING



TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.

NOTE

Due to the harsh environment in which these fans operate, they require periodic replacement.

(1) Remove

(a) Open CB-11 to remove power from fan circuit.

NOTE

Air flow directional arrows of upper fan will be on the bottom of the fan assembly and indicate flow toward exterior. Air flow directional arrows of lower fan will be on the top of the fan assembly and indicate flow into interior.

(b) There are two fans on the Auxiliary door. The two fans are mounted 180 degrees from each other, enabling the top fan to vent exhaust to the outside while the bottom fan draws fresh air inside.

- (c) Open auxiliary door to gain access to both sides of fan fastener screws and power connector.
- (d) Disconnect the Conexall twist-lock (W55-1 or W55-2) DC Power connector from the fan body.
- (e) The top fan will have the blade side turned inward; the bottom fan will have the blade side turned outward.
- (f) To remove the top fan, first remove the shroud assembly from the fan assembly shroud adaptor tabs. Using a #2 cross-tip screwdriver and 11/32 inch wrench, remove three #8-32 x 1/2 inch pan head cross-recessed screws six #8 x 3/8 inch flat washers and three #8-32 nylon insert locking nuts.
- (g) Remove shroud from adaptor plate.
- (h) Using a #2 cross-tip screwdriver and 11/32 inch wrench, remove shroud adapter plate and grill from fan body by removing four #8-32 x 5/8 inch pan head cross-recessed screws, eight #8 flat washers , four #8 nylon locking nuts.
- (i) Remove adapter plate and grill from fan.

NOTE

The following step may require two personnel as screws are loose in bezel holes, which causes them to tilt downward, allowing spacers to fall off screws if not held in place.

(j) Remove the four #8-32 x 1-1/4 inch pan head cross-recessed screws and four #8 flat washers, eight #8 nylon lock nuts from fan body through the door bezel. Remove the fan from screws while screws are still inserted through bezel. Remove the four #8 spacers on each screw from interior side of screw. Now remove screws from bezel.

(k) To remove the bottom fan, remove the shroud assembly from the fan assembly shroud adaptor tabs. Using a #2 cross-tip screwdriver and 11/32 inch wrench, remove three #8-32 x 1/2 inch pan head cross-recessed screws six #8 x 3/8 inch flat washers and three #8-32 nylon insert locking nuts.

- (l) Remove shroud from adaptor plate.

NOTE

This step may require two personnel as screws are loose in bezel holes, which causes them to tilt downward, allowing spacers to fall off screws if not held in place.

(m) Using a #2 cross-tip screwdriver and 11/32 inch wrench, remove shroud adapter plate and grill from fan body by removing four #8-32 x 5/8 inch pan head cross-recessed screws, eight #8 flat washers , four #8 Nylon locking nuts.

(n) Using a #2 cross-tip screwdriver, 1/4 inch drive ratchet with 11/32 inch socket, remove adapter plate and grill from fan body by removing four #8-32 x 1-1/4 inch pan head cross-recessed screws and four #8 flat washers into pre-drilled holes of Door Vent Fan bezel from outside pointing inward. On the interior side, position a spacer on each screw.

(2) Replace

NOTE

Air flow directional arrows of upper fan will be on the bottom of the fan assembly and indicate flow toward exterior. Air flow directional arrows of lower fan will be on the top of the fan assembly and indicate flow into interior.

(a) Install fan guard plate onto screws of lower fan assembly.

NOTE

Upper fan assembly will not have fan guard installed.

(b) Orient upper fan assembly so wiring is in lower right hand corner and directional arrows indicate air flow exhaust.

(c) Orient lower fan assembly so wiring is in upper right-hand corner and directional arrows indicate air flow intake.

NOTE

On the lower fan assembly the label will be facing away from the bezel opening.

(d) Using a #2 cross-tip screwdriver and 11/32 inch wrench, install four #8-32 x 1/4 inch pan head cross recessed screws, four #8 x 3/8 inch flat washers and four #8 nylon insert locking nuts.

(e) Position shroud adaptor onto front of fan assembly using mounting tabs on top left and right.

(f) Install fan grill onto shroud adaptor and secure with four #8-32 x 5/8 inch pan head cross-recessed screws, eight #8 x 3/8 inch flat washers, and four #8-32 nylon insert locking nuts.

(g) Using a #2 cross-tip screwdriver and 11/32 inch wrench, tighten the hardware.

(h) Position fan shroud assembly onto the front side of the fan assembly mating with shroud adaptor tabs using three #8-32 x 1/2 inch pan head cross-recessed screws, six #8 x 3/8 inch flat washers, and three #8-32 nylon insert locking nuts.

7-10. REMOVE AND REPLACE OVERHEAD LIGHTING.

TOOLS: Screwdriver, Cross-tip, #2

MATERIALS/PARTS: Lighting assembly (Figure 8-21, Item 1)

MOS: Personnel for initial examination: 0861.

Personnel for troubleshooting and replacement: 0844.



TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.

a. Remove

- (1) Remove the overhead light connection by unscrewing the cable on the light (W67-1 or W67-2).
- (2) Using a cross-tip #2 screwdriver, remove four 10-24 x 1 inch screws attaching light fixture to shelter ceiling. Retain hardware for installation.

b. Replace

- (1) Using a cross-tip #2 screwdriver, install overhead light assemblies to threaded holes in ceiling using four #10-24 x 1 inch pan head cross-recessed screws, four #10 lock washers, and four #10 x 7/16 inch flat washers.
- (2) Reattach the overhead light connection (W67-1 or W67-2).

7-11. REMOVE AND REPLACE RELAY, ELECTROMAGNETIC.MATERIALS/PARTS: Relay, Electromagnetic, 24 Volts Direct Current (VDC) (Figure 8-17, Item 1)

MOS: Personnel for troubleshooting and replacement: 1141.



TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.



Electromagnetic relay supplies power to shelter lighting and is located in MTS battery compartment.

a. Remove

- (1) Open CB-10 to remove power.
- (2) Open PDU door and locate relay in bottom right hand corner.
- (3) Pull relay up in a motion 90 degrees ($^{\circ}$) from socket base to unplug.

b. Replace

- (1) Align new relay in socket key and press down in one smooth motion.
- (2) Close PDU door and secure.

7-12. REMOVE AND REPLACE DIPLEXER.

TOOLS: Screwdriver, cross-tip, #2
Wrench, 1/4 inch

MATERIALS/PARTS: Diplexer (Figure 8-13, Item 5)
Nut, self-locking (Figure 8-13, Item 3)

MOS: Personnel for troubleshooting and replacement: 0844 or 0861.



TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.

NOTE

When removing the diplexer inside the battery compartment, use the procedures in paragraph 7-13 for battery removal.

a. Remove

- (1) Remove RF cables from diplexer. On diplexer 1 and 2 these are W9 and W2-2. On diplexer 3 and 4 these are W3-5 and W2-1.
- (2) Ensure each cable is labeled for location, destination, and function.
- (3) Using a #2 cross-tip screwdriver and 1/4 wrench, remove screws attaching diplexer to mounting bracket. Retain hardware.

b. Replace

- (1) Using a #2 cross-tip screwdriver and 1/4 wrench, attach new diplexer to mounting bracket using original screws.
- (2) Reattach RF cables to diplexer IAW labeling.
- (3) If replacing diplexer in battery compartment, refer to paragraph 7-13 to replace batteries.

7-13. REMOVE AND REPLACE BATTERIES**NOTE**

This section does not include vehicle batteries. This section only addresses batteries installed and used in MTS.

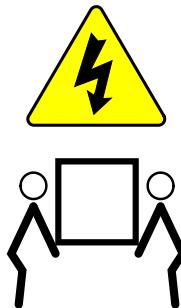
TOOLS: 1/2 inch wrench

MATERIALS/PARTS: Batteries, storage (Figure 8-5, Item 2)

SAFETY EQUIPMENT: Gloves, chemical and oil protective (Appendix B, Item 19)
Goggles, industrial (Appendix B, Item 17)

PERSONNEL REQUIRED: Two

MOS: Personnel for troubleshooting and replacement: Any MOS

WARNING

- SERIOUS ELECTRICAL HAZARDS EXIST WHEN WORKING WITH VEHICLE/MTS BATTERY SYSTEM AND BATTERY CHARGER CONTROL. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, TAKE APPROPRIATE PRECAUTIONS.
- TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ALWAYS HANDLE BATTERIES WITH RUBBER GLOVES AND SAFETY GLASSES DUE TO HIGHLY ACIDIC ELECTROLYTE SOLUTION WITHIN BATTERIES. DAMAGE TO EQUIPMENT AND SERIOUS INJURY COULD RESULT FROM SPILLAGE.
- THE BATTERY IS A TWO-PERSON LIFT. THE BATTERY IS DIFFICULT TO PICK UP AND MOVE. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE THAT YOU HAVE GOOD FOOTING AND A CLEAR PATH TO BATTERY COMPARTMENT.
- TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE ALL POWER IS REMOVED AND ALL CIRCUIT BREAKERS ARE OPEN BEFORE CONNECTING BATTERIES.



- **FOR SAFETY, IT IS RECOMMENDED THAT BATTERY CABLES BE LABELED PRIOR TO DISCONNECTION IN ORDER TO ENSURE CABLES ARE RECONNECTED CORRECTLY.**
- **TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT, ALWAYS REMOVE NEGATIVE (-) CABLE FIRST WHEN DISCONNECTING THE BATTERIES.**

NOTE

MTS batteries consist of two 24VDC batteries controlled by a battery charger control that regulates charging and on-line battery use.

a. Remove

- (1) Loosen straps on battery tray and move to one side so as not to interfere with battery removal.
- (2) Remove terminal covers from battery posts.
- (3) Using a 1/2 inch wrench, loosen battery cable connectors on battery terminals.

NOTE

Battery cables are color-coded. Red denotes a positive cable or terminal and black denotes a negative cable or terminal.

- (4) Remove NEGATIVE (-) battery cable connector (W220); and then POSITIVE (+) battery cable connector (W210) from battery terminals and slide battery connector covers back over connectors to insulate from metal objects.
- (5) Remove battery jumper cable (W219).
- (6) Remove battery from battery compartment and dispose IAW local Standard Operating Procedures (SOPs), IAW local hazardous waste handling and disposal requirements, and Marine Corps orders.
- (7) Repeat steps (1) through (6) for second battery.

b. Replace

NOTE

Ensure that the positive (+) battery posts are positioned toward roadside.

- (1) Lift battery and position on the battery tray.
- (2) Pull battery terminal covers back to expose battery terminals and cable end connectors.

(3) Using a 1/2 inch wrench, connect W210 P1 to POSITIVE (+) post on Battery #1 from CB1 LINE in PDU. Slide battery post cover back over terminals to insulate from metal objects.

(4) Using a 1/2 inch wrench, connect W219 P1 to NEGATIVE (-) post on Battery #1 then connect W219 P2 to POSITIVE (+) post on Battery #2. Slide battery post covers back over terminals to insulate from metal objects.

(5) Using a 1/2 inch wrench, connect W220 P1 to NEGATIVE (-) post on Battery #2. Slide battery post covers back over terminals to insulate from metal objects.

(6) Position strap over battery and adjust tension on battery strap using ratchet strap.

(7) Ensure battery security straps are reconnected and tightened to prevent battery movement in battery compartment.

7-14. REMOVE AND REPLACE BATTERY CHARGER CONTROL.

TOOLS: Wrench, 1/2 inch
 Socket, Drive, 1/2 inch
 Ratchet, Drive, 3/8 inch
 Screwdriver, Cross-tip, #2
 Wrench, 11/16 inch

MATERIALS/PARTS: Control, battery charger (Figure 8-19, Item 1)
 Sealing compound (Appendix B, Item 7)
 Washer, lock (Figure 8-19, Item 3)

SAFETY EQUIPMENT: Goggles, industrial (Appendix B, Item 17)

MOS: Personnel for troubleshooting and replacement: 1141 or 1142.



- **SERIOUS ELECTRICAL HAZARDS EXIST WHEN WORKING WITH VEHICLE/MTS BATTERY SYSTEM AND BATTERY CHARGER CONTROL. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, TAKE APPROPRIATE PRECAUTIONS.**
- **ALWAYS HANDLE BATTERIES WITH RUBBER GLOVES AND SAFETY GLASSES DUE TO HIGHLY ACIDIC ELECTROLYTE SOLUTION WITHIN BATTERIES. DAMAGE TO EQUIPMENT AND SERIOUS INJURY COULD RESULT FROM SPILLAGE.**
- **HAZARDOUS VOLTAGES EXIST IN SHELTER ALTERNATING CURRENT (AC)/DC ELECTRICAL POWER SYSTEMS. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE ALL ELECTRICAL POWER TO SHELTER IS OFF PRIOR TO BEGINNING. REMOVE ALL INCOMING ELECTRICAL POWER FROM ALL SOURCES, INCLUDING GENERATOR OR VEHICLE BATTERY.**

a. Remove

- (1) Remove power from battery charger control by opening CB-1 (DC source for power supply (inverter)) and CB-2 (DC Bus CB) on PDU.
- (2) Position CB-19 on battery box cover inside MTS to the open position.
- (3) Open battery compartment door on exterior curbside wall of shelter.
- (4) Using a 1/2 inch wrench, remove battery cables from MTS batteries. Label cables as to location/destination, slide rubber boots down over ends, and move aside so they do not touch battery terminals. Refer to paragraph 7-13 for battery removal and replacement.
- (5) Remove W233 P2, W254-1, W263, and W256 by pulling terminals from battery charger control.
- (6) Using a 1/2 inch socket with a 3/8 inch drive ratchet, remove W214 P2 and W230 S1 from battery charger control.
- (7) Using a #2 cross-tip screwdriver, remove retaining screws and washers attaching battery charger control assembly to battery compartment wall. Retain hardware for installation. Discard lock washers.

NOTE

Do not reuse lock washers. Always replace lock washers with new ones.

- (8) Remove battery charger control assembly from shelter.
- (9) Using a #2 cross-tip screwdriver, remove battery charger control from bracket.

b. Replace



- **CHEMICAL PROTECTIVE GLOVES MUST BE WORN WHEN WORKING WITH SEALING COMPOUND, POLYSULFIDE. INJURY TO PERSONNEL MAY RESULT IF CHEMICALS CONTACT UNPROTECTED SKIN. SMOKING IS PROHIBITED WHEN WORKING WITH FLAMMABLE MATERIALS.**
- **HAZARDOUS VOLTAGES EXIST IN SHELTER ALTERNATING CURRENT (AC)/DC ELECTRICAL POWER SYSTEMS. TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE ALL ELECTRICAL POWER TO SHELTER IS OFF PRIOR TO BEGINNING. REMOVE ALL INCOMING ELECTRICAL POWER FROM ALL SOURCES, INCLUDING GENERATOR OR VEHICLE BATTERY.**

- (1) Position battery charger control over threaded inserts on battery charger control bracket.
- (2) Using a #2 cross-tip screwdriver, install two #10-24 x 3/4-inch pan head cross-recessed screws (GR8), two #10 x 1/2 inch flat washers (GR8), and two #10 lock washers (GR8).
- (3) Connect wire W233 P2 to battery charger control (Batt -) connection.
- (4) Connect W254-1 to Start Assist on battery charger control.
- (5) Connect W254-2 to Common on micro-switch on battery charger control.
- (6) Connect W256 to NO on micro-switch on battery charger control.
- (7) Position battery charger control assembly over threaded inserts on front wall of MTS.
- (8) Using a #2 cross-tip screwdriver, install the battery charger control using two #10-24 x 3/4 inch pan head cross-recessed screws (GR8), two #10 x 1/2 inch flat washers (GR8), and two #10 lock washers (GR8).
- (9) Connect wire W214 P2 to battery charger control VB1. Using an 11/16 inch socket and 3/8 inch drive ratchet, tighten connection.
- (10) Connect wire W230 S1 to battery charger control VB2. Route along bottom edge of power supply (inverter) bracket.
- (11) Refer to paragraph 7-13 to replace batteries.

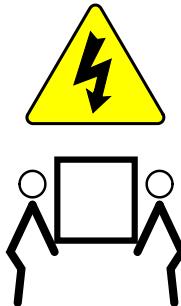
7-15. REMOVE AND REPLACE POWER SUPPLY (INVERTER).

TOOLS: Screwdriver, Cross-tip, #2
Screwdriver, Flat Head, 3/32 inch wide
Screwdriver, Flat Head, 1/4 inch wide
Screwdriver, Flat Head, 3/16 inch wide
Wrench, 7/16 inch
Socket, Deep Well, 1/2 inch
Extension, 10 inch
Ratchet, Drive 3/8 inch

MATERIALS/PARTS: Power supply (inverter) (Figure 8-12, Item 9)
Washer, lock (Figure 8-12, Item 2)

PERSONNEL REQUIRED: Two

MOS: Personnel for troubleshooting and replacement: 0844 or 0861 and 1141 or 1142



- **TO AVOID SERIOUS INJURY OR DEATH TO PERSONNEL, ENSURE SHELTER MAIN BREAKER IS IN THE OFF POSITION AND ALL POWER IS REMOVED FROM POWER SUPPLY (INVERTER).**
- **POWER SUPPLY (INVERTER) REQUIRES A TWO-PERSON LIFT.**

NOTE

Refer to OutBack Extreme Rugged Inverter/Charger Power Systems Installation and User Manual for more detailed information on operations, maintenance, installation, and repair of power supply (inverter).

a. Remove

- (1) Remove power by opening all CBs on the PDU and CB-19.
- (2) Gain access to power supply (inverter) through battery door.
- (3) Remove batteries (refer to paragraph 7-13 to remove batteries).

NOTE

Hold top cover after removing top cover hardware due to fan wires connected under clear plastic cover.

- (4) Using #2 cross-tip screwdriver, remove four cross-recessed screws from front cover of power supply (inverter).
- (5) Using a #2 cross-tip screwdriver, remove two #10 cross-recessed screws from clear plastic cover on front of power supply (inverter). Retain hardware.
- (6) Using a 3/32 screwdriver, remove entire green fan jack connected to the top of the power supply (inverter) which are permanently attached to the front cover.
- (7) Using a 1/4 inch flat screwdriver, remove all other wires connected to the power supply (inverter). (W203-3 from AC HOT OUT, W203-4 from AC NEU OUT, W205-2 from CHASSIS GROUND, W204 from AC NEUT IN, and W203-2 from AC HOT IN). Retain jumper for future installation.
- (8) Using a 3/16 inch flat screwdriver, loosen W-208 box lug cable from terminal board.

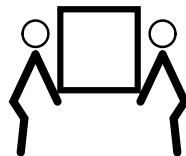
(9) Using a 1/2 inch wrench, loosen DC cables (W223-1 to NEG inverter post and W223-2 to POS inverter post), remove hardware, then remove cables.

NOTE

Remove the battery compartment access panel inside the MTS, if needed, to reach the top left 5/16-18 mount bolt.

(10) Using 1/2 inch deep well socket, 10 inch extension, and 3/8 ratchet, remove the four 5/16-18 bolts securing the power supply (inverter) to the mount shelf.

(11) Lift power supply (inverter) from battery compartment and remove from shelter.



**TO PREVENT INJURY TO PERSONNEL, POWER SUPPLY (INVERTER) REQUIRES
A TWO-PERSON LIFT.**

b. Replace.

- (1) Using #2 cross-tip screwdriver, remove four cross-recessed screws from front cover of power supply (inverter).
- (2) Using a #2 cross-tip screwdriver, remove two #10 cross-recessed screws from clear plastic cover on front of power supply (inverter). Set plastic cover to the side.
- (3) Position power supply (inverter) onto power supply (inverter) support assembly oriented as unit removed.
- (4) Using 1/2 inch deep well socket, 10 inch extension, and 3/8 ratchet, attach the four 5/16-18 x 1 inch hex cap screws (GR8), four 5/16 inch lock washers (GR8), and four 5/8 inch flat washers (GR8) to the power supply (inverter) to the mount shelf.
- (5) Using a 1/2 inch wrench, place DC cables (W223-1 to NEG inverter post and W223-2 to POS inverter post) on power supply (inverter) and tighten.
- (6) Using a 1/4 inch flat screwdriver, tighten W-208 box lug cable to power supply (inverter).
- (7) Using a 3/16 inch flat screwdriver, tighten all other wires previously removed to the inverter. (W203-3 from AC HOT OUT, W203-4 from AC NEU OUT, W205-2 from CHASSIS GROUND, W204 from AC NEUT IN, and W203-2 from AC HOT IN). Install retained jumper.
- (8) Using a 3/32 screwdriver, tighten the two wires, which are permanently attached to the front cover, to the top of the power supply (inverter). Connect green jack into the power inverter.
- (9) Using a #2 cross-tip screwdriver, tighten two #10 cross-recessed screws from clear plastic cover on front of power supply (inverter).
- (10) Using #2 cross-tip screwdriver, tighten four cross-recessed screws from front cover of power supply (inverter).

- (11) Replace batteries (refer to paragraph 7-13 for battery replacement).

7-16. REMOVE AND REPLACE KEYBOARD DISPLAY UNIT.

MATERIALS/PARTS: KDU (Figure 8-22, Item 2)

MOS: Personnel for troubleshooting and replacement: Any MOS.

a. Remove

- (1) Disconnect interface cable (W80) from KDU.
- (2) On the KDU mounting plate, slide locking bar to unlocked position.
- (3) Remove the KDU from the locking bar.

b. Replace

- (1) Insert KDU onto KDU mount plate by sliding locking bar to unlocked position and inserting the KDU onto the mounting plate.
- (2) Slide locking bar into the locked position.
- (3) Connect interface cable to KDU.

7-17. REMOVE AND REPLACE AFATDS POWER CONDITIONER/CONVERTER.

MATERIALS/PARTS: Power conditioner/converter (unit supplied)

MOS: Personnel for troubleshooting and replacement: 0844 or 0861.



**TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE
POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL
COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.**

a. Remove

- (1) Open CB-3 and CB-14.
- (2) Disconnect all cables from front of AFATDS PCC: Grounding wire (W246), AC OUT (W228), DC IN (W229), AC IN (W227).
- (3) Remove wing-nut securing grounding wire and remove grounding wire from AFATDS PCC.
- (4) Release retention strap.
- (5) Slide AFATDS PCC from shelf and remove from shelter.

b. Replace

- (1) Position new AFATDS PCC on shelf where previous AFATDS PCC was located. Slide AFATDS PCC into place and tighten with retention strap.
- (2) Connect grounding wire (W246) to AFATDS PCC and use original wing nuts to tighten securely in place.
- (3) Connect W228 to AC OUT, W229 to DC IN, and W227 to AC IN.

7-18. REMOVE AND REPLACE ENHANCED POSITION LOCATION AND REPORTING SYSTEM RADIO SYSTEM.

NOTE

Reference TM 10901A-OR/2 for EPLRS and User Read Out (URO) details.

MATERIALS/PARTS: EPLRS radio system (unit supplied)

MOS: Personnel for troubleshooting and replacement: 0844, 0848, 0861, or 06XX

a. Remove

- (1) Power down all equipment in shelter equipment rack (refer to radio rack power down procedures in Chapter 5).
- (2) Disconnect and remove cables (W1-3 to J2, A300528-1 to J3) from EPLRS R/T and set aside for installation.
- (3) Unlock and release EPLRS R/T and slide out from mounting base.

b. Replace

- (1) Slide EPLRS into mounting slot in mounting base and lock into place.
- (2) Reattach W1-3 to J2 of EPLRS radio.
- (3) Reattach A3005328-1 to J3.

7-19. REMOVE AND REPLACE EPLRS USER READ-OUT.

NOTE

Reference TM 10901A-OR/2 for EPLRS and URO details.

MATERIALS/PARTS: EPLRS URO (unit supplied)

MOS: Personnel for troubleshooting and replacement: 0844, 0861, or 06XX.

a. Remove

- (1) Disconnect cable from URO to EPLRS mounting base (80063-A3005328-1 and 80063-A3109227) and set aside.
- (2) Remove URO from mounting bracket and set aside.

b. Replace

- (1) Position new URO in same location in mounting bracket as original URO.
- (2) Connect cable (80063-A3005328-1 and 80063-A3109227) from new URO to EPLRS mounting base.

7-20. REMOVE AND REPLACE AN/VRC-110 RADIO SYSTEM.

TOOLS: Wrench, 1/2 inch
Socket, Drive, 1/2 inch
Extension, 6 inch
Ratchet, Drive 3/8 inch

MATERIALS/PARTS: Radio system (unit supplied)

MOS: Personnel for troubleshooting and replacement: 0844, 0848, 0861, or 06XX.

a. Remove

- (1) Ensure radio systems are switched OFF and appropriate CB to equipment rack is switched OFF (refer to radio rack power down procedures in Chapter 5).
- (2) Disconnect cables from AN/PRC-152 radios (12053-1420-A2 and 12049-0500-01) and remove from mounts in AN/VRC-110 VAA. (Refer to Publication Number 10515-0283-4300)
- (3) Disconnect all cables from SINCGARS AN/VRC-110 radio VAA (W65 and W9 (x 4)).
- (4) Release and slide AN/VRC-110 VAA out of shock mount in shelter radio rack.
- (5) If necessary, use a 1/2 inch wrench, 1/2 inch socket, 6 inch extension, and 3/8 inch ratchet to remove bolts securing shock mount to equipment rack and remove shock mount from equipment rack. Retain hardware. Discard lock washers.

b. Replace

- (1) Reinstall shock mount into shelter equipment rack. Align holes in shock mount with original holes in equipment rack, insert screws, and lock washers into rack.
- (2) Use a 1/2 inch wrench, 1/2 inch socket, 6 inch extension, and 3/8 inch ratchet, tighten hardware.
- (3) Slide AN/VRC-110 VAA into shock mount tray and lock into place.
- (4) Reattach cables removed from AN/VRC-110 VAA.
- (5) Reattach cables removed from AN/PRC-152 radios.

7-21. REMOVE AND REPLACE LOUDSPEAKER CONTROL UNIT.

TOOLS: Socket, 7/16 inch
Ratchet, Drive 3/8 inch

MATERIALS/PARTS: Loudspeaker control unit (Figure 8-23, Item 4)
Washer, lock (Figure 8-23, Item 2)

MOS: Personnel for troubleshooting and replacement: 0844, 0861, or 06XX.

NOTE

Ensure SINCGARS AN/VRC-110 radio system (in vehicle) is powered down prior to performing procedure.

a. Remove

- (1) Remove radio handset from loudspeaker control unit.
- (2) Remove remote control cable from loudspeaker control unit.
- (3) Using a 7/16 inch socket with 3/8 inch drive ratchet, remove two 1/4 inch-20 x 4-1/2 inch hex cap screws, two 1/4 inch x 5/8 inch flat washers, and two 1/4 inch medium split lock washers holding loudspeaker control unit to shelter's secondary personnel door. Retain hardware for installation. Discard lock washers.

NOTE

Do not reuse lock washers. Always replace lock washers with new ones.

b. Replace

- (1) Position new loudspeaker control unit on shelter roadside personnel door.
- (2) Using a 7/16 inch socket with 3/8 inch drive ratchet, install two 1/4 inch-20 x 4-1/2 inch hex cap screws, two 1/4 inch x 5/8 inch flat washers, and two 1/4 inch medium split lock washers to hold loudspeaker control unit to shelter's secondary personnel door.
- (3) Reattach loudspeaker control unit remote cable to loudspeaker control unit's connector.
- (4) Reattach radio handset to loudspeaker control unit connector.

7-22. REMOVE AND REPLACE 4-PORT USB HUB.

MATERIALS/PARTS: Hub, USB (Figure 8-26, Item 1)
Fastener tape, hook and loop (Figure 8-26, Item 2)
Strap, tiedown, electrical components (Appendix B, Item 8)

MOS: Personnel for troubleshooting and replacement: 0844.



TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.

a. Remove

- (1) Locate 4-port USB hub on radio rack.

(2) Remove three USB cables and remove from metal bracket.

b. Replace

(1) Position hook and loop fastener tape on radio rack.

(2) Position new USB hub on radio rack.

(3) Connect all USB cables IAW labeling.

7-23. REMOVE AND REPLACE ADP INTERFACE UNIT.

TOOLS: Wire Cutters

Screwdriver, Cross-tip, #2

MATERIALS/PARTS: Interface unit, auto data processor (Figure 8-15, Item 5)
Strap, tiedown, electrical components (Appendix B, Item 8)
Washer, lock (Figure 8-15, Item 2)

PERSONNEL REQUIRED: Two

MOS: Personnel for troubleshooting and replacement: 0651 or 0861.

a. Remove

(1) Open CB-15 on the PDU.

(2) Label all incoming and outgoing cables to ADP interface unit.

(3) Using wire cutters, remove cable ties or other retaining devices and disconnect all cables attached to ADP interface unit (W7-1, W7-2, W7-3, W7-4, W7-5, W7-6, W7-7, and W7-8).

(4) Trace electrical power cable to ADP interface unit and remove cable ties.

(5) Contact communications personnel to check ADP interface unit software and configuration. The replacement ADP interface unit may not have the latest SW updates or the proper configuration used by the artillery unit.

(6) Using a #2 cross-tip screwdriver, remove ground cable from ADP interface unit.

(7) Using a #2 cross-tip screwdriver, remove two 1/4 inch-20 x 1 inch pan head cross-recessed screws, two 1/4 inch x 11/16 inch flat washers, and two 1/4 inch medium split lock washers to remove brackets holding ADP interface unit.

(8) Remove ADP interface unit.

b. Replace

(1) Place ADP interface unit on second radio rack shelf from top.

(2) Using a #2 cross-tip screwdriver, secure bracket with two 1/4 inch-20 x 1 inch pan head cross-recessed screws, two 1/4 inch x 11/16 inch flat washers, and two 1/4 inch medium split lock washers.

(3) Using a #2 cross-tip screwdriver, install ground cable.

(4) Install incoming and outgoing cables to ADP interface unit (W7-1, W7-2, W7-3, W7-4, W7-5, W7-6, W7-7, and W7-8).

(5) Contact Communications Personnel to check ADP interface unit software and configures. The replacement ADP may not have the latest SW updates or the proper configuration used by the artillery unit.

7-24. REMOVE AND REPLACE AFATDS COMPUTERS.

MATERIALS/PARTS: AFATDS computer (unit supplied)

MOS: Personnel for troubleshooting and replacement: 0844 or 0848.

NOTE

Refer to AFATDS computer system documentation for detailed instruction on operations and maintenance of AFATDS computer system. Refer to Getac M230 User's Manual for operations, maintenance, and repair of system.

a. Remove Computer #1

- (1) Shut down AFATDS computer #1.
- (2) Slide out shelf number four.
- (3) Unlock and lift lid on computer shock mount.
- (4) Disconnect USB connectors on computer bracket to computer.
- (5) Disconnect VGA cable (W81-2) to computer.
- (6) Disconnect W7-9 from computer.
- (7) Disconnect Alternating Current (AC) power adapter from computer's power connector.
- (8) Disconnect AC power adapter from outlet on raceway.
- (9) Stow AFATDS computer power converter in power supply bracket on side of radio rack VAA shelf.
- (10) Remove AFATDS computer.

b. Replace Computer #1

- (1) Ensure computer is powered OFF.
- (2) Connect Alternating Current (AC) power adapter to computer's power connector.
- (3) Connect AC power adapter to outlet on raceway.
- (4) Stow AFATDS computer power converter in power supply bracket on side of radio rack VAA shelf.
- (5) Connect USB connectors on computer bracket to computer.
- (6) Connect VGA cable (W81-2) to computer.
- (7) Connect W7-9 to computer.

c. Remove Computer #2

- (1) Shut down AFATDS computer #2.

- (2) Slide out shelf number five.
- (3) Unlock and lift lid on computer shock mount.
- (4) Disconnect USB connectors on computer bracket to computer.
- (5) Disconnect VGA cable (W81-1) to computer.
- (6) Disconnect W7-10 from computer.
- (7) Disconnect Alternating Current (AC) power adapter from computer's power connector.
- (8) Disconnect AC power adapter from outlet on raceway.
- (9) Stow AFATDS computer power converter in power supply bracket on side of radio rack VAA shelf.
- (10) Remove AFATDS computer.

d. Replace Computer #2

- (1) Ensure computer is powered OFF.
- (2) Connect Alternating Current (AC) power adapter to computer's power connector.
- (3) Connect AC power adapter to outlet on raceway.
- (4) Stow AFATDS computer power converter in power supply bracket on side of radio rack VAA shelf.
- (5) Connect USB connectors on computer bracket to computer.
- (6) Connect VGA cable (W81-1) to computer.
- (7) Connect W7-10 to computer from ADP interface unit.

7-25. REMOVE AND REPLACE DISPLAY UNIT.

TOOLS: Screwdriver, Cross-tip #2
Wrench, Hex (kit provided)

MATERIALS/PARTS: Display unit (Figure 8- 25, Item 3)
Strap, tiedown, electrical components (Appendix B, Item 8)

PERSONNEL REQUIRED: Two

MOS: Personnel for troubleshooting and replacement: 0844, 0848, or 0861.

a. Remove



TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.

- (1) Open CB-15.
- (2) Pull display unit forward from mounting bracket and locate screws in rear holding display unit to bracket.
- (3) Using a #2 cross-tip screwdriver, remove retaining screws and set aside for reuse.

NOTE

The display units inside the shelter can be set down on work area to remove from mounting bracket. However, the display units on the primary door will require two personnel (one to hold the display unit and one to remove or replace display unit to the mounting bracket).

- (4) Lay display unit on shelter tabletop face down.
- (5) Remove VGA (W47) cable from display unit.
- (6) Disconnect and remove electrical power cable running to display unit.

NOTE

Cable may be embedded within same flexible plastic cable conduit with AC power raceway or simply plugged into a shelter tabletop outlet.

b. Replace

- (1) Using a #2 cross-tip screwdriver, attach Omni mount to computer monitor with kit-provided hardware and secure.
- (2) Remove cap from base and save for later installation.
- (3) Using kit-provided hex key, remove mount base with directional arrow from Omni-mount to remove bottom screw.
- (4) Using a #2 cross-tip screwdriver, install the mount base to monitor housing with arrow facing up using two 1/4-20 x 3/4 inch cross-recessed screws, two 1/4 inch flat washers, and two 1/4" lock washers.
- (5) Attach monitor with the swing arm attached to mount base in monitor box by inserting swing arm upper ring on to upper peg then swing arm downward to align the bottom screw hole on mount base.
- (6) Using a #2 cross-tip screwdriver, tighten mount base screws.

(7) Using provided hex key, install mount fastening screw through mount base and into swing arm and tighten fully.

NOTE

Cap fits only one way.

(8) Using provided hex wrench, insert kit into cap and reinstall cap onto base of Omni-mount base by snapping it into place.

7-26. REMOVE AND REPLACE RADIO FREQUENCY POWER DIVIDERS.

TOOLS: Screwdriver, Cross-tip #2

Wrench, 3/8 inch

Wire Cutters

MATERIALS/PARTS: Adhesive (Appendix B, Item 23)

Divider, power, radio frequency 2-port (Figure 8-20, Item 4)

Divider, power, radio frequency 4-port (Figure 8-20, Item 5)

Strap, tiedown, electrical components (Appendix B, Item 8)

MOS: Personnel for troubleshooting and replacement: 0844, 0848, 0861, or 06XX.

WARNING



TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE POWER IS REMOVED FROM SHELTER BEFORE REPLACING ELECTRICAL COMPONENTS. SERIOUS INJURY OR DEATH CAN OCCUR.

a. Remove

(1) Open CB-15.

(2) Label all cables to RF power divider.

(3) Remove VGA input cables (W81-1 and W81-2) and power supply cable from RF power divider.

(4) Remove VGA output cables (W47-1, W47-6, W47-3, and W47-5) from RF power divider.

(5) Using a #2 cross-tip screwdriver and 3/8 inch wrench, remove upper bracket of RF power divider assembly from the printer shelf.

(6) Using a #2 cross-tip screwdriver, remove the upper bracket of the RF power divider assembly from the bottom bracket.

(7) Remove RF power dividers.

(8) Using a #2 cross-tip screwdriver, remove RF power divider power supply mounting bracket from curbside wall under PDU.

(9) Using a #2 cross-tip screwdriver, remove RF power divider power supplies from curbside wall under PDU.

(10) Using wire cutters, cut cable ties and remove RF power divider power supplies.

b. Replace

(1) Position 4-port RF power divider onto RF power divider bottom bracket.

(2) Place a piece of 1/16 inch self-adhesive foam between the two RF power dividers and insert 2-port RF power divider on top of 4-port RF power divider. Trim the foam flush with the edges.

(3) Place the RF power dividers on the top bracket.

(4) Mount RF power divider bottom bracket onto RF power divider top bracket.

(5) Using a #2 cross-tip screwdriver, secure with two #10-32 x 1/2 inch pan head cross-recessed screws, two #10 x 3/8 inch flat washers, and two #10 med lock washers.

(6) Position RF power divider top bracket over holes on underside of printer bracket.

(7) Using a #2 cross-tip screwdriver and 3/8 inch wrench, insert two #10-32 x 1/2 inch pan head cross-recessed screws through the top side of printer bracket, through the RF power divider top bracket. Place two #10 x 3/8 inch flat washers, two #10 x 3/8 inch flat washers, and two #10-32 lock nuts on screws and secure.

(8) Attach VGA input cables (W81-1 and W81-2), VGA output cables (W47-1, W47-6, W47-3, and W47-5), and power cable (W47-4) to RF power divider IAW cable labeling.

(9) Using a #2 cross-tip screwdriver, replace RF power divider power supplies under PDU on curbside wall.

(10) Place cover (with notched end down) over RF power divider power supplies. Using a #2 cross-tip screwdriver, install RF power divider power supply bracket to curbside wall using two #10-24 x 3/4 inch pan head cross-recessed screws, two #10 x 1/2 inch flat washers, and two #10 medium lock washers.

7-27. REMOVE AND REPLACE PERSONNEL DOOR LATCH.

To open MTS in the unlikely event that primary door handle is failing to engage the roller latch assembly and allow the door to be opened, perform the following procedure:



To prevent damage to equipment in the unlikely event that the primary personnel door latch assembly fails and access to the MTS is not possible, refer to TM 10-5411-235-13&P and Addendum and the procedure below.

a. Remove

(1) Remove the door handle. Refer to TM 10-5411-235-13&P and Addendum.

(2) Remove shaft. Tap out square shaft centered on opening created by removed door handle.

(3) Open door.

b. Replace. Reassemble door hardware and mechanism. Refer to TM 10-4311-235-13&P and Addendum.

CHAPTER 8

REPAIR PARTS LIST

8-1. INTRODUCTION. The spares and repair parts required for performance of organizational maintenance of the Mobile Tactical Shelter (MTS) are defined in the Repair Parts and Special Tools List (RPSTL). They authorize the requisitioning and issue of spares and repair parts as indicated by the Source Maintenance Recoverability (SMR) codes.

8-2. GENERAL.

This chapter contains indentured part listings and illustrations necessary for disassembly, repair, and assembly of Advanced Field Artillery Tactical Data System (AFATDS) shelter and equipment. Parts lists are separated into figures by main groups of assemblies and are keyed to illustrations by item numbers.

- a. Repair Parts and Special Tools List. The RPSTL defines spares and repair parts authorized for use in the performance of maintenance. The list also includes parts which must be removed for replacement of authorized parts. Parts lists are composed of parts in each group listed in figure and number sequence.

NOTE

When a stock number item is requisitioned, the item received may have a different PN than the part being replaced.

- b. National Stock Number. An index in National Stock Number (NSN) sequence appears in the back of this manual. NSNs and Part Numbers (PNs) are cross-referenced to each illustration figure and item number.

NOTE

Illustrations may have parts removed for clarity.

8-3. EXPLANATION OF COLUMNS.

- a. (Column 1) Figure Number. The Figure Number indicates figure number of illustration in which the item is shown.
- b. (Column 2) Item Number. The Item Number is used to identify the item called out in the illustration. When a figure has more than one illustration, an item may appear on several illustrations. Items which contain a dash before the item number are no-illustrated parts which are contained in the assembly.
- c. (Column 3) Source Maintenance Recoverability Codes. The SMR code is five-digit code (e.g., PAOZZ) consisting of the paragraphs (1) through (3) below.

(1) Source Code. Source Codes indicate the manner of acquiring items for maintenance, repair, or overhaul of end items. Source codes are entered in first and second position of SMR code format as follows.

Code	Definition
PA	Item procured and stocked for anticipated or known usage.
PB	Item procured and stocked for insurance purposes because essentiality dictates minimum quantity available in supply systems.
PC	Item procured and stocked which otherwise would be code PA except that it is deteriorative in nature.
PD	Support item, excluding support equipment, procured for initial issue or outfitting and stocked only for subsequent or additional initial issues or outfitting. Not subject to automatic replenishment.
PE	Support equipment which will not be stocked but which will be centrally procured on demand.
PF	Item which will not be stocked but which will be centrally procured on demand.
PG	Item procured and stocked to provide for sustained support for the life of the equipment. It is applied to an item peculiar to equipment, that would prove uneconomical to reproduce at a later time due to probable discontinuance or shutdown of production facilities.
KD	Item of depot overhaul/repair kit and not purchased separately. Depot kit defined as a kit that provides items required at the time of overhaul or repair.
KF	Item of maintenance kit and not purchased separately. Maintenance kit is defined as a kit which provides an item which can be replaced at the organizational or intermediate levels of maintenance.
KB	Items included in both a depot overhaul/repair kit and a maintenance kit.
MO	Item manufactured or fabricated at organizational level, 2 nd echelon.
MF	Item manufactured or fabricated at intermediate maintenance levels, 3 rd echelon.
MH	Item manufactured or fabricated at intermediate maintenance levels, 4 th echelon.
MD	Item manufactured or fabricated at depot maintenance level, 5 th echelon.
AO	Item assembled at organizational level 2 nd echelon.
AF	Item assembled at intermediate maintenance levels 3 rd echelon.
AH	Item assembled at intermediate maintenance levels 4 th echelon.
AD	Item assembled at depot maintenance levels 5 th echelon.
XA	Item not procured or stocked because requirements will result in replacement of next higher assembly.
XB	Item not procured or stocked. If not available through salvage, requisition.
XC	Installation drawing, diagram, instruction sheet, field service drawing identified by manufacturers' part number.
XD	A support item is not stocked. When required, item will be procured through normal supply channels.

(2) Maintenance Code. Maintenance codes are assigned to indicate the levels of maintenance authorized to remove and repair an item. The maintenance codes are entered in the third and fourth positions of the SMR Code:

(a) The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove and replace the item. The maintenance code entered in the third position will indicate one of the following levels of maintenance.

Code	Application/Explanation
O	The lowest maintenance level capable of complete repair of the item is at the organizational level (1 st and 2 nd echelon).
F	The lowest maintenance level capable of complete repair of the item is at the intermediate support level (3 rd echelon).
H	The lowest maintenance level capable of complete repair of the item is at the intermediate support level (4 th echelon).
L	Item is removed, replaced, used at designated specialize Repair activity.
D	The lowest maintenance level capable of complete repair of the item is at depot (5 th echelon).
Z	Item is not authorized to be removed or replaced at any maintenance level. This code assigned to items not required for support in a specific application, and is identified for reference purposes only.
B	No repair is authorized. The item may be reconditioned by adjusting, lubricating, etc. at the user level. No parts or special tools are procured for the maintenance of this item.

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i.e., all authorized maintenance functions). This position will contain one of the following maintenance codes:

Code	Application/Explanation
O	Organizational level (1 st and 2 nd echelon).
F	Field (3 rd echelon).
H	Field (4 th echelon).
K	Reparable item; repair, condemnation, and disposal to be performed at contractor facility.
D	Depot (5 th echelon).
L	Repair restricted to designated Specialized Repair Activity.
Z	Non-repairable; no repair is authorized.
B	No repair authorized. Item may be reconditioned by adjusting, lubricating, etc., at user level. No parts or special tools are procured for maintenance of this item.

(3) Recoverability Code. Recoverability codes are assigned to support items to indicate disposition action on unserviceable items. Recoverability codes are entered in fifth position of uniform SMR code format as follows:

Code	Application/Explanation
Z	Non-repairable item. When unserviceable, condemn and dispose at level indicated in position 3.
O	Repairable item. When uneconomically repairable, condemn and dispose of at organizational level.
F	Repairable item. When uneconomically repairable, condemn and dispose of at field maintenance level (3 rd echelon).
H	Repairable item. When uneconomically repairable, condemn and dispose of at field maintenance level (4 th echelon).
D	Repairable item. When beyond lower level or repair capability, return to depot. Condemnation and disposal not authorized below depot level.
L	Repairable item. Repair, condemnation, and disposal not authorized below depot level.
A	Item requires special handling or condemnation procedures because of specific reasons (i.e., precious metal content, high dollar value, critical material). Refer to appropriate manuals/directives for specific instructions.

d. (Column 4) National Stock Number. This column lists the NSNs assigned to the item. Use assigned NSNs in requests/requisitions.

e. (Column 5) Commercial and Government Entity. The Commercial and Government Entity (CAGE) codes are five-digit codes assigned to manufacturers/non-manufacturers organizational entities and contractors. The primary use of the CAGE coding system is in machine accounting operations related to support management programs, such as cataloging and standardization. The CAGE code is used in conjunction with firm's reference number relating firm with item of supply, production, or designing cataloging and other supply record, as well as on engineering documentation. These codes are essential to contract/purchase agreements and various activities'/agencies' automated data processing systems. Use CAGE code and reference number to screen item identifications against each other to detect duplication.

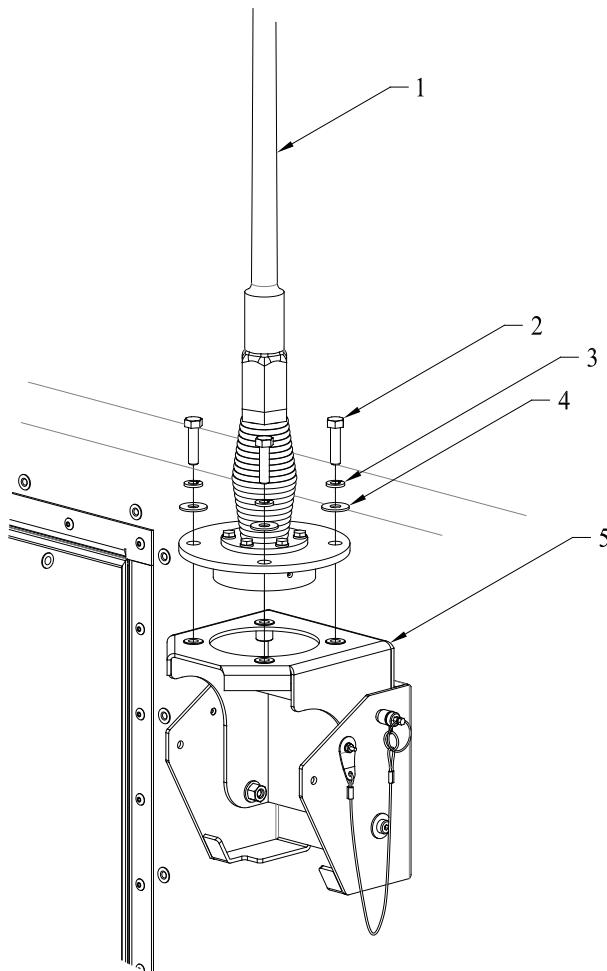
f. (Column 6) Part Number. The PN indicates primary number used by manufacturer (individual, company, firm, corporation or government activity), which controls the design and characteristics of the item by means of engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

NOTE

When NSN item is requisitioned, the item received may have a different part number than part being replaced but is a suitable replacement.

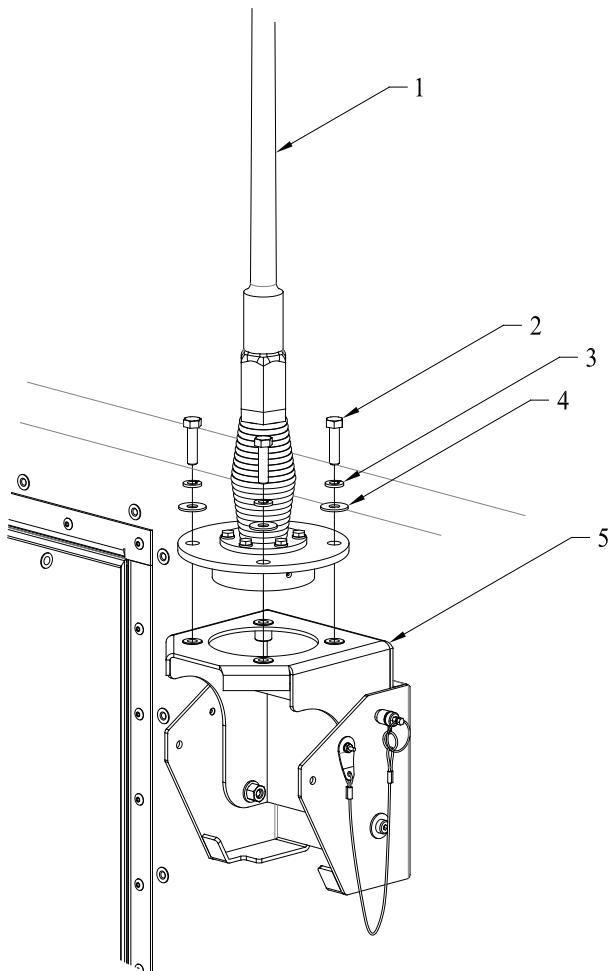
g. (Column 7) Description. The Description indicates the federal item name and, if required, minimum description to identify items. Items included in kits and sets are listed below name of kit or set with quantity of each item in the kit or set indicated in the quantity incorporated in the unit column. When the part used differs between serial numbers of same model, effective serial numbers are shown as last line of description.

h. (Column 8) Quantity. The Quantity (Qty) indicates basic unit of measure of listed item as used in performing actual maintenance function. Measure is expressed by two-character alphabetical abbreviation (e.g., ea., in, pr, etc.). When unit of measure differs from unit of issue, requisition lowest unit of issue that satisfies required units of measure.



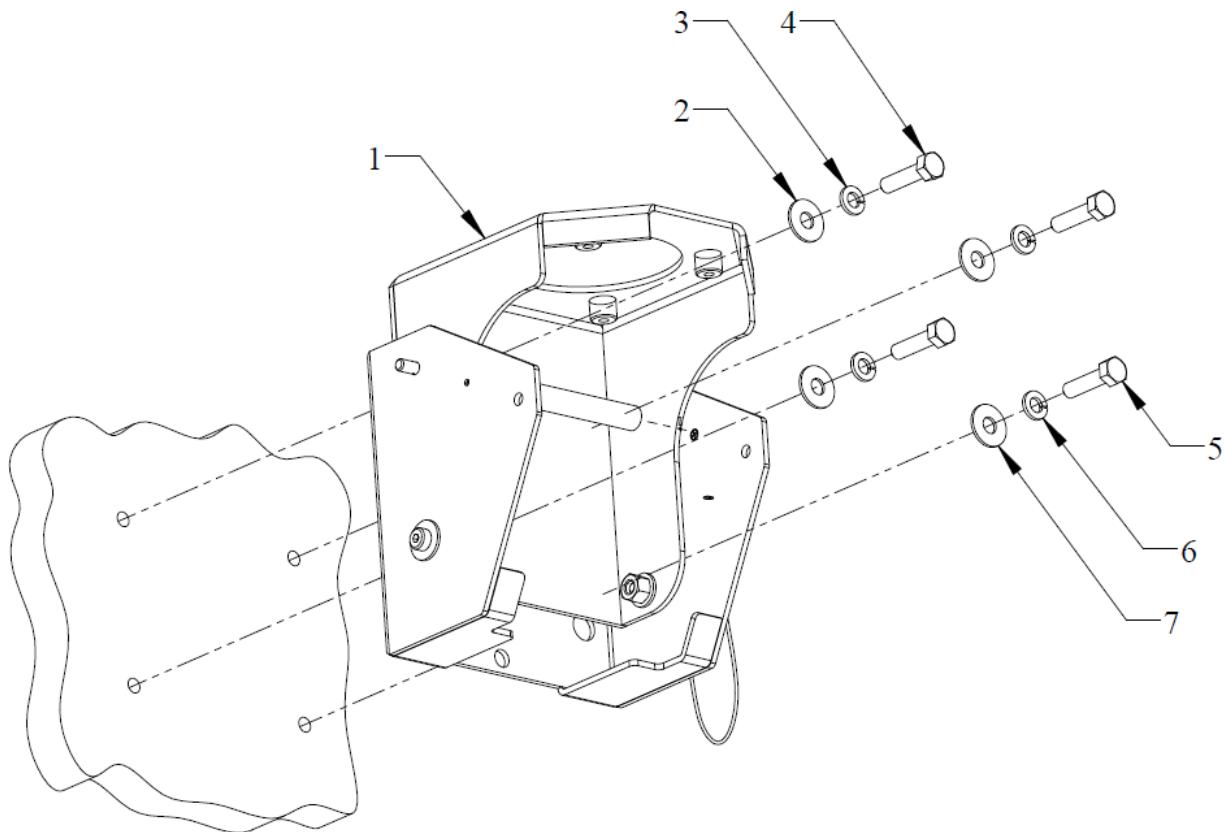
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-1	1	PAOZZ	5820-01-183-9462	80063	A3005031	ANTENNA, EPLRS	1
8-1	2	PAOZZ	5305-00-226-4831	80204	B1821BH031C150N	SCREW, Cap, Hexagon Head, 5/16-18 X 1.50 ,YZ	4
8-1	3	PAOZZ	5310-00-012-0214	96906	MS35338-26	WASHER, Lock, 5/16 X .583, YZ	4
8-1	4	PAOZZ	5310-00-081-4219	96906	MS27183-12	WASHER, Flat, 5/16, YZ	4
8-1	5	PAOZZ		01365	08020E0001	ANTENNA MOUNTING BRACKET	1

Figure 8-1. Enhanced Position Location and Reporting System Antenna Assembly



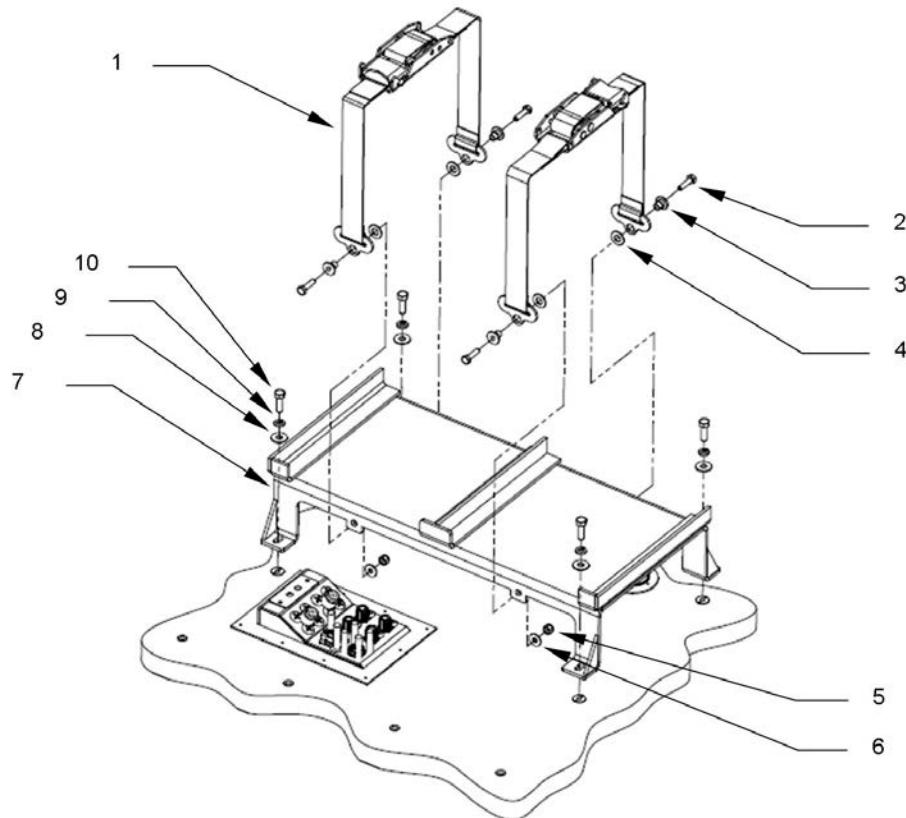
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-2	1	PAOZZ	5985-01-537-8837	80063	RF-390-AT005	ANTENNA, SINCGARS	1
8-2	2	PAOZZ	5306-00-226-4829	80204	B1821BH031C125N	SCREW, Cap, Hexagon Head, 5/16-18 X 1.25 ,YZ	4
8-2	3	PAOZZ	5310-00-012-0214	96906	MS35338-26	WASHER, Lock, 5/16 X .583, YZ	4
8-2	4	PAOZZ	5310-00-081-4219	96906	MS27183-12	WASHER, Flat, 5/16, YZ	4
8-2	5	PAOZZ		01365	08020E0001	ANTENNA MOUNTING BRACKET	1

Figure 8-2. Single Channel Ground-to-Air Radio System Antenna Assembly



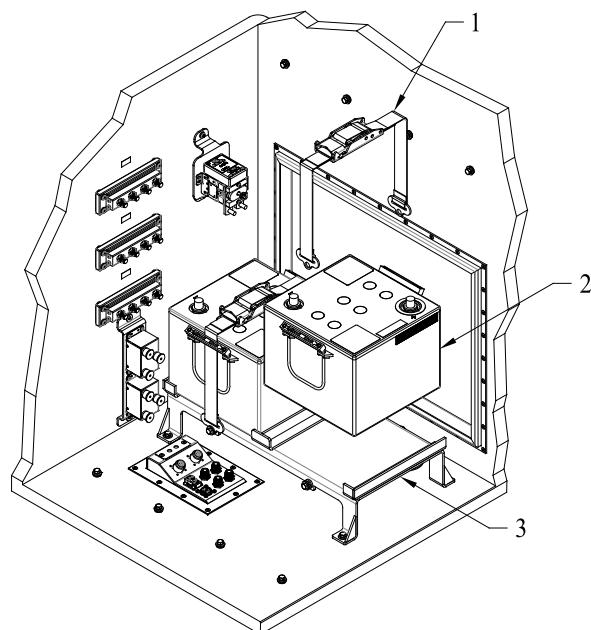
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-3	1	PAOZZ		01365	08020G0003	ANTENNA MOUNTING ASSEMBLY	1
8-3	2	PAOZZ	5310-00-809-4058	96906	MS27183-10	WASHER, Flat, .25 X .625, YZ	3
8-3	3	PAOZZ		80205	AEW07X250000GY0AS1	WASHER, Lock, 1/4-20, YZ	3
8-3	4	PAOZZ		80204	B1821BH025C100N	SCREW, Cap, Hexagon Head, 1/4-20 X 1.00, YZ	3
8-3	5	PAOZZ	5305-00-207-8253	80205	MS35307-308	SCREW, Cap, Hexagon Head, 1/4-20 X 1.00, SS	1
8-3	6	PAOZZ	5310-00-933-8121	80205	MS35338-139	WASHER, Lock, 1/4, SS	1
8-3	7	PAOZZ	5310-00-952-0309	80205	NAS620-C416	WASHER, Flat, .25 X .438, SS	1

Figure 8-3. Antenna Mounting Bracket



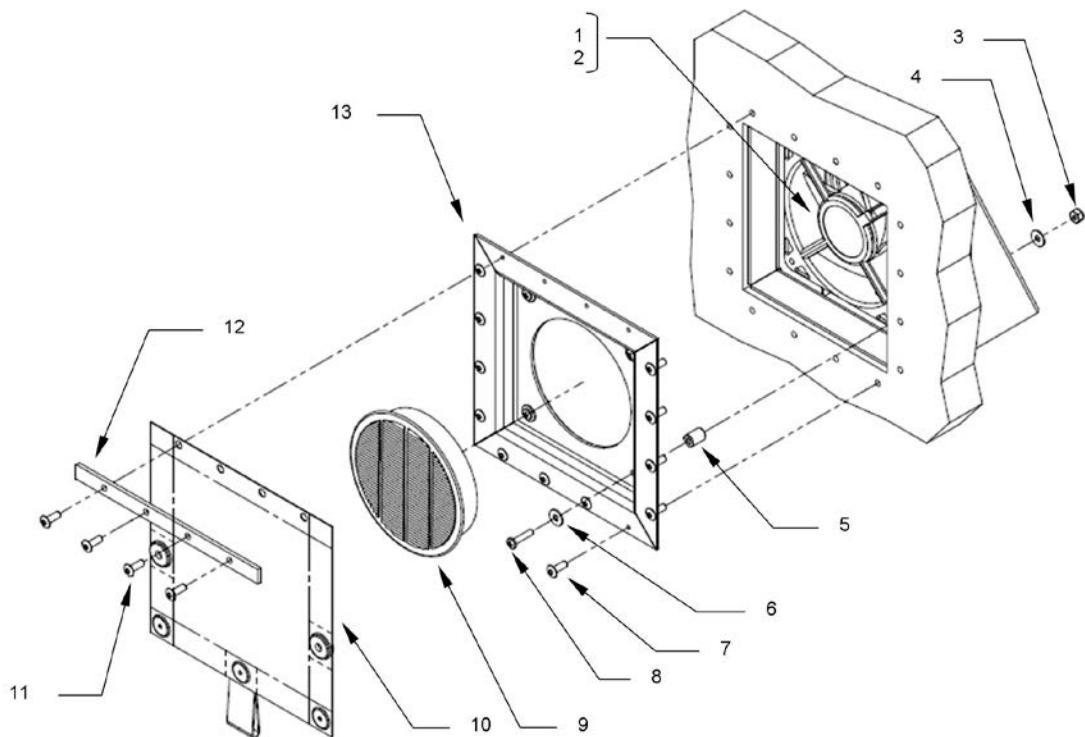
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-4	1	XBFZZ		01365	08020E0034	TIE DOWN STRAP	2
8-4	2	PAFZZ	5305-00-225-3843	80204	B182BH025C100N	SCREW CAP, Hex Head	4
8-4	3	XBFZZ		01365	08020E0031	BUSHING	4
8-4	4	XBFZZ		01365	08020E0032	ELECTRICAL TRAY COLLAR	4
8-4	5	PAFZZ	5310-01-531-7280	81349	M45913/1-4CG8Z	NUT, Self-Locking	4
8-4	6	PAFZZ	5310-00-809-4058	96906	MS27183-10	WASHER, Flat	4
8-4	7	XBFZZ		01365	08020E0033	BATTERY TRAY	1
8-4	8	PAFZZ	5310-00-809-4058	96906	MS27183-10	WASHER, Flat	4
8-4	9	PAFZZ	5310-01-588-1252	0Y3H3	AEW07X250000GY0AS1	WASHER, Lock	4
8-4	10	PAFZZ	5305-00-068-0515	80204	B182BH025F100N	SCREW CAP, Hex Head	4

Figure 8-4. Battery Tray Assembly



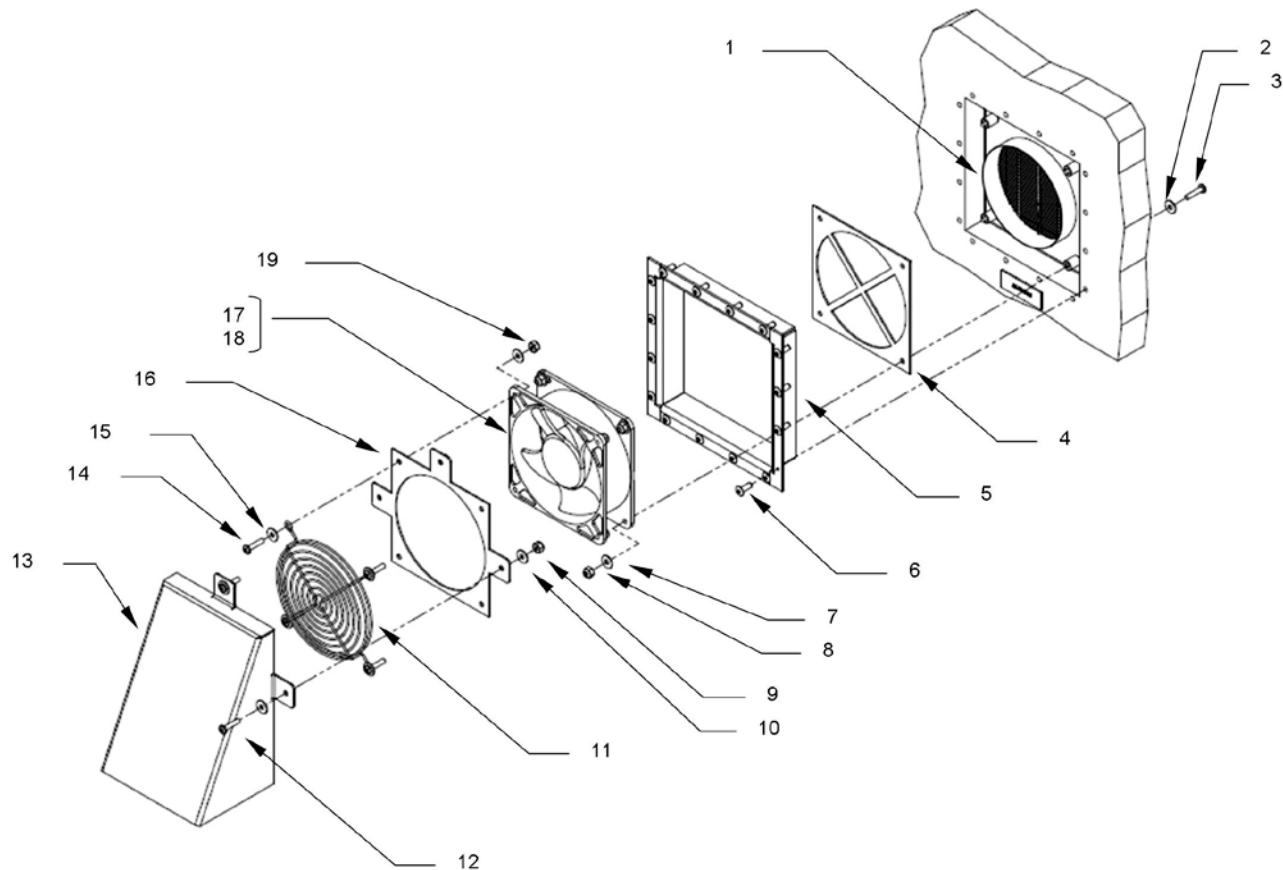
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-5	1	PAOZZ		01365	08020E0034	TIE DOWN STRAP	2
8-5	2	PAOZZ	6140-01-485-1472	0WY95	9750N7025	BATTERY, Storage	2
8-5	3	XBFZZ		01365	08020E0033	BATTERY TRAY	1

Figure 8-5. Battery Assembly



(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-6	1	PAFZZ		01365	08020B0055-1	FAN, Axial – Modified (Upper)	1
8-6	2	PAFZZ		01365	08020B0055-2	FAN, Axial – Modified (Lower)	1
8-6	3	PAFZZ	5310-00-512-9061	96906	M45913/1-08CS6	NUT, Self-Locking	4
8-6	4	PAFZZ	5310-00-088-5978	96906	MS15795-807	WASHER, Flat	4
8-6	5	PADZZ	5365-01-546-6549	39428	92320A525	SPACER, Sleeve	4
8-6	6	PADZZ	5310-00-880-5978	96906	MS15795-807	WASHER, Flat	4
8-6	7	PADZZ	5320-00-420-2165	81349	M24243/7A604H	RIVET, Blind	12
8-6	8	PADZZ	5305-00-054-6675	96906	MS51957-50	SCREW, Machine Pan Head	4
8-6	9	XBDZZ		07918	40RLSSBB	LOUVER, Metal	1
8-6	10	XBDZZ		01365	08020E0051	WEATHER FLAP, Door Vent	1
8-6	11	PADZZ	5320-00-956-7355	81349	M24243/6A604H	RIVET, Blind	4
8-6	12	XBDZZ		01365	08020E0050	WEATHER FLAP RETAINER, Door Vent	1
8-6	13	XBDZZ		01365	08020E0045	VENT PAN, Secondary Door	1

Figure 8-6. Rear Door Fan Assembly

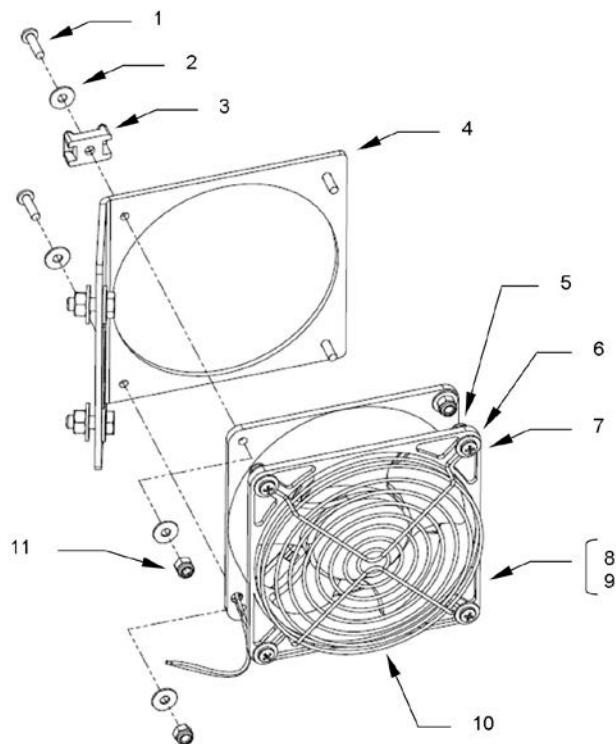


(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-7	1	PAFZZ		07918	40RLSSBB	LOUVER, Metal	1
8-7	2	PAFZZ	5310-00-088-5978	96906	MS15795-807	WASHER, Flat	4
8-7	3	PAFZZ	5305-00-054-6675	96906	MS51957-50	SCREW, Machine, Pan Head	4
8-7	4	XBDZZ		01365	08020E0048	BASEPLATE, Upper Fan Note: Not used with Upper Door Fan Assembly	1
8-7	5	XBDZZ		01365	08020E0046	VENT BEZEL, Secondary Door	1
8-7	6	PADZZ	5320-00-420-2165	81349	M24243/7A604H	RIVET, Blind	16
8-7	7	PAFZZ	5310-00-880-5978	96906	MS15795-807	WASHER, Flat	4
8-7	8	PAFZZ	5310-01-512-9061	96906	M45913/1-08CS6	NUT, Self-Locking	4
8-7	9	PAFZZ	5310-01-512-9061	96906	M45913/1-08CS6	NUT, Self-Locking	3

Figure 8-7. Shelter Door Fan Assembly (Sheet 1 of 2)

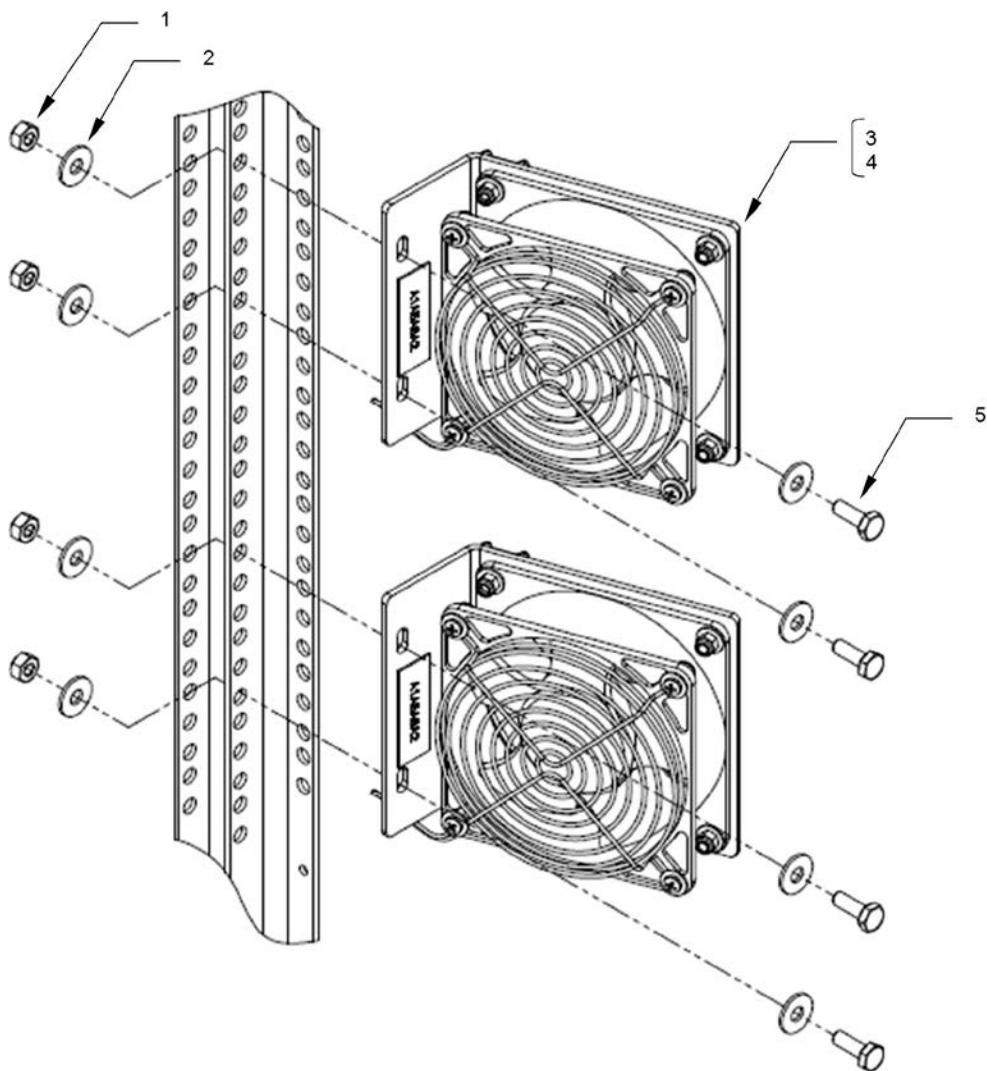
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-7	10	PAFZZ	5310-00-880-5978	96906	MS15795-807	WASHER, Flat	6
8-7	11	PAFZZ	4140-01-368-9091	25795	4C657	FAN GUARD	1
8-7	12	PAFZZ	5305-00-054-6670	96906	MS51957-45	SCREW, Machine Pan Head	3
8-7	13	XBDZZ		01365	08020E0049	FAN SHROUD	1
8-7	14	PAFZZ	5305-00-054-6672	96906	MS51957-47	SCREW, Machine, Pan Head	4
8-7	15	PAFZZ	5310-00-880-5978	96906	MS15795-807	WASHER, Flat	8
8-7	16	XBDZZ		01365	08020E0047	BASE PLATE, Lower Fan	1
8-7	17	XAFZZ		01365	08020B0055-1	FAN, Axial - Modified (Upper)	1
8-7	18	XAFZZ		01365	08020B0055-2	FAN, Axial - Modified (Lower)	1
8-7	19	PAFZZ	5310-01-512-9061	96906	M45913/1-08CS6	NUT, Self-Locking	4

Figure 8-7. Shelter Door Fan Assembly (Sheet 2 of 2)



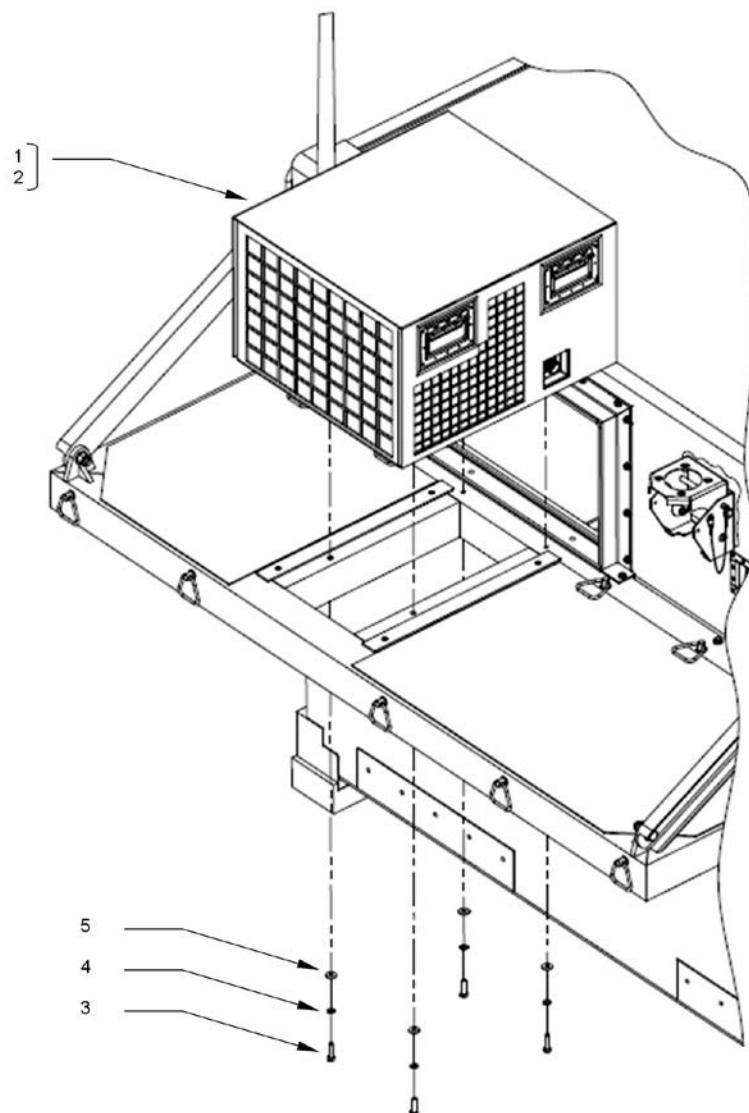
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-8	1	PAFZZ	5305-00-054-6672	96906	MS51957-47	SCREW, Machine, Pan Head	4
8-8	2	PAFZZ	5310-00-880-5978	96906	MS15795-807	WASHER, Flat	8
8-8	3	PAFZZ	5975-01-036-7522	06383	TM3S10-CO	MOUNTING BASE, Tie Down, Electrical	1
8-8	4	XBFZZ		01365	08020E0066	FAN BRACKET	1
8-8	5	PAFZZ	5310-01-512-9061	96906	M45913/1-010FS6	NUT, Self-Locking	4
8-8	6	PAFZZ	5310-00-880-5978	96906	MS15795-807	WASHER, Flat	8
8-8	7	PAFZZ	5305-00-054-6672	96906	MS51957-47	SCREW, Machine, Pan Head	4
8-8	8	XBFZZ		01365	08020B0055-5	FAN, Axial - Modified (Upper)	1
8-8	9	XBFZZ		01365	08020B0055-6	FAN, Axial - Modified (Lower)	1
8-8	10	PAFZZ	4140-01-368-9091	25795	4C657	FAN GUARD	1
8-8	11	PAFZZ	5310-01-512-9061	96906	M45913/1-010FS6	NUT, Self-Locking	4

Figure 8-8. Vent Fan Assembly



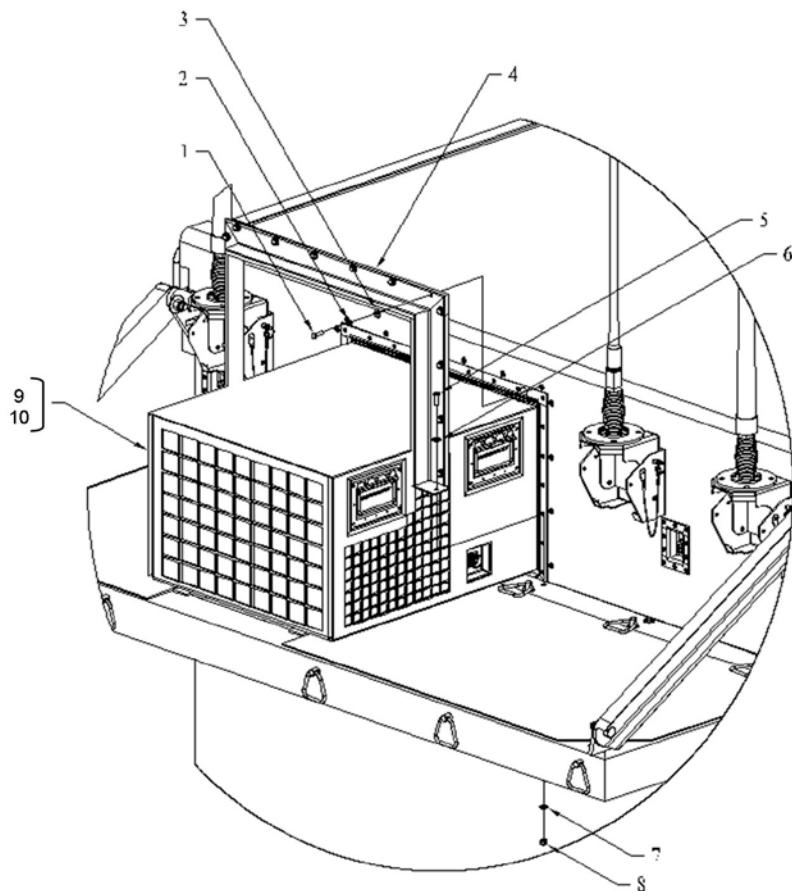
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-9	1	PAFZZ	5310-01-509-8656	1QNZ3	M45913/1-4CS6	LOCK NUT, Nylon Insert	4
8-9	2	PAFZZ	5310-00-582-5677	80205	MS15795-810	WASHER, Flat	8
8-9	3	XBFZZ		01365	08020B0055-5	FAN, Axial – Modified (Upper)	1
8-9	4	XBFZZ		01365	08020B0055-6	FAN, Axial – Modified (Lower)	1
8-9	5	PAFZZ	5305-01-564-5768	0Y3H3	MS35307-306	SCREW CAP, Hex Head	4

Figure 8-9. Radio Rack Fan Assembly



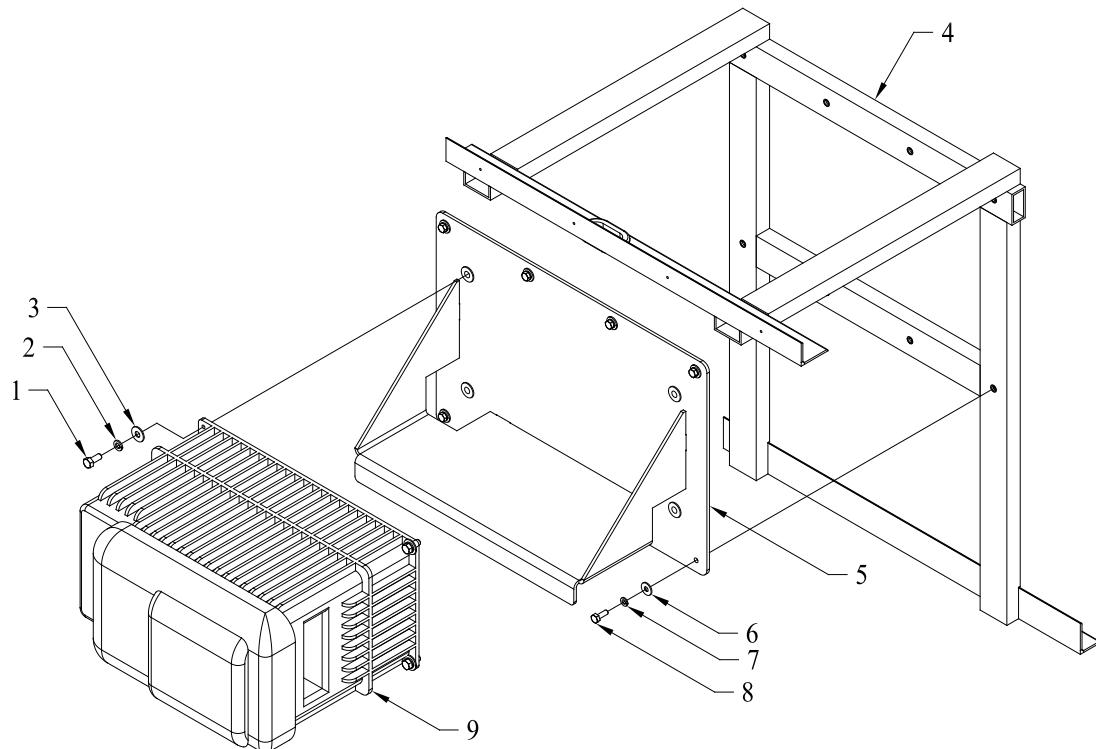
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(10) Qty
8-10	1	PAFFF	4120-01-581-2650	OWJEF	GSQ386ZABNW0011	AIR CONDITIONER OR	1
8-10	2	PAFFF	4120-01-552-5223	OWJEF	GSQ346ZABNW00G1	AIR CONDITIONER	1
8-10	3	PAFZZ		80204	AES01F375A50WA6DG1	SCREW, Cap, Hexagon Head, 3/8-24 X 1-1/2, YZ	4
8-10	4	PAFZZ		80204	AEW07X375000GY0AS1	WASHER, Lock, 3/8 X .680, YZ	4
8-10	5	PAFZZ	5310-00-087-7493	96906	MS27183-13	WASHER, Flat, .375 X .875, YZ	4

Figure 8-10. Air Conditioner (Bottom Assembly)



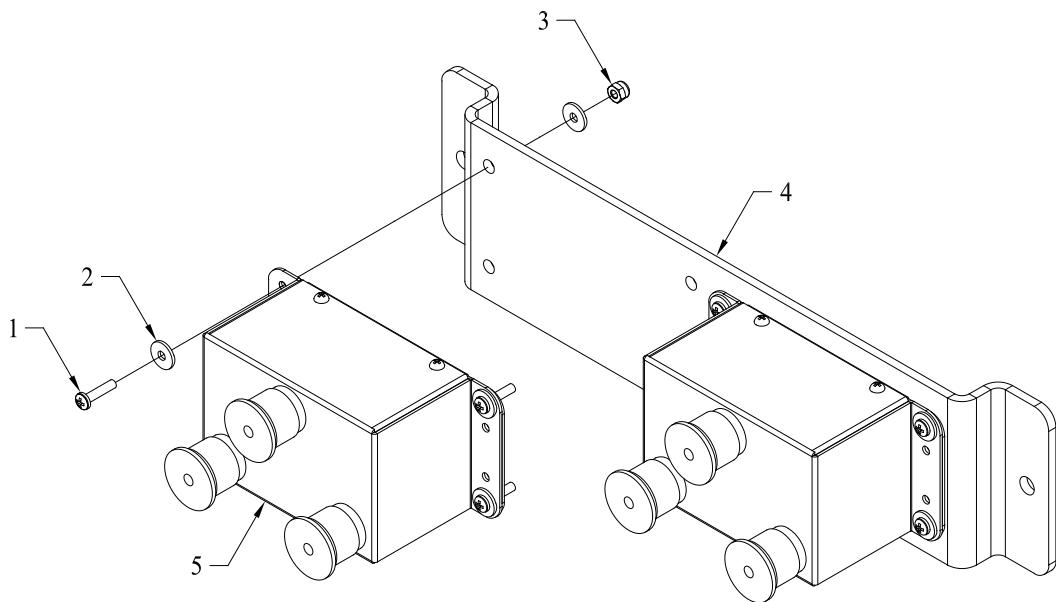
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-11	1	PAFZZ	5305-00-225-3843	80204	B182BH025C100N	SCREW, Cap, Hexagon Head	14
8-11	2	PAFZZ		80204	AEW07X250000GY0AS1	WASHER, Lock	14
8-11	3	PAFZZ	5310-00-809-4058	96906	MS27183-10	WASHER, Flat	14
8-11	4	XBFZZ		01365	08020E0111	EXTERIOR BRACKET, Rain Guard, AC	1
8-11	5	PAFZZ	5305-00-051-4078	80204	B1821BH031F125N	SCREW, Cap, Hexagon Head	2
8-11	6	PAFZZ	5310-00-081-4219	96906	MS27183-12	WASHER, Flat	2
8-11	7	PAFZZ	5310-00-081-4219	96906	MS27183-12	WASHER, Flat	2
8-11	8	PAFZZ	5310-01-551-9262	1QN23	M45913/1-5FG82	NUT, Locking	2
8-11	9	PAFFF	4120-01-581-2650	OWJEI	GSQ386ZABNW0011	AIR CONDITIONER OR	1
8-11	10	PAFFF	4120-01-552-5223	OWJEI	GSQ346ZABNW00G1	AIR CONDITIONER	1

Figure 8-11. Air Conditioner Assembly



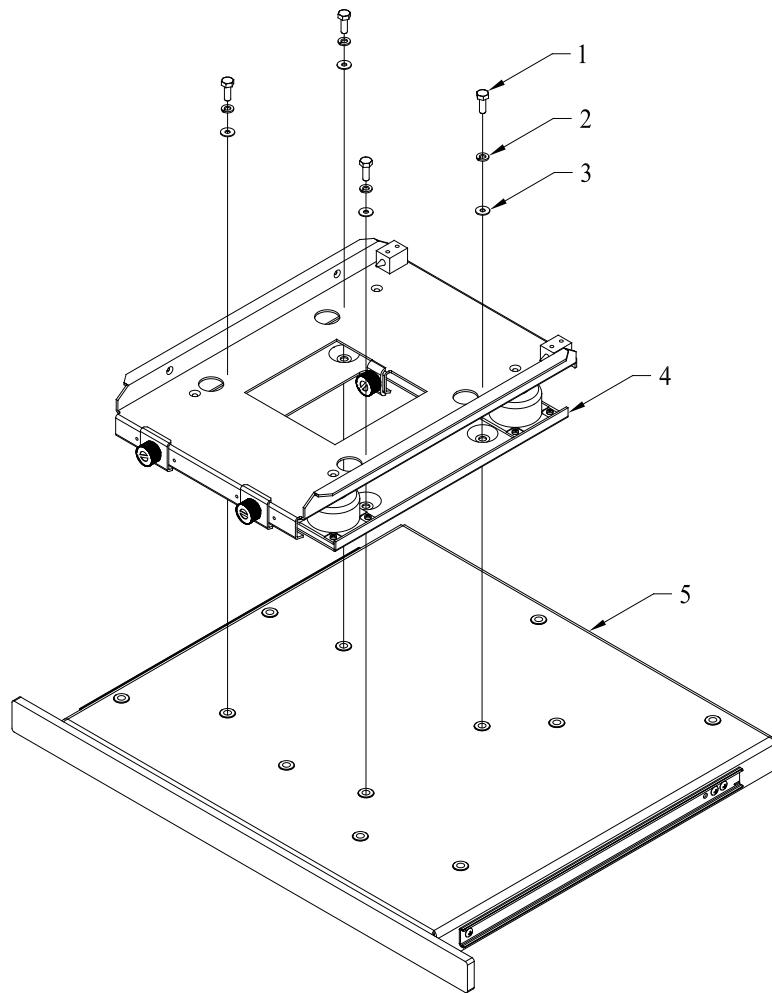
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(10) Qty
8-12	1	PAFZZ	5305-00-225-3843	80204	B1821BH025C100N	SCREW CAP, Hex Head	4
8-12	2	PAFZZ		0Y3H3	AEW07X250000GY0AS1	WASHER, Lock	4
8-12	3	PAFZZ		39428	AEW24X25N000WA6A81	WASHER, Flat	4
8-12	4	XBFZZ		01365	08020E0043	BATTERY BOX FRAME	1
8-12	5	XBFZZ		01365	08020E0044	INVERTER SUPPORT	1
8-12	6	PAFZZ		39428	AEW24X25N000WA6A81	WASHER, Flat	8
8-12	7	PAFZZ		39428	AEW07X250000GY0AS1	WASHER, Lock	8
8-12	8	PAFZZ	5305-00-225-3843	80204	B1821BH025C100N	SCREW CAP, Hex Head	8
8-12	9	PAFLL		3YMC5	OBX-GIC2524P-120/60	POWER SUPPLY	1

Figure 8-12. Power Supply (Inverter) Assembly



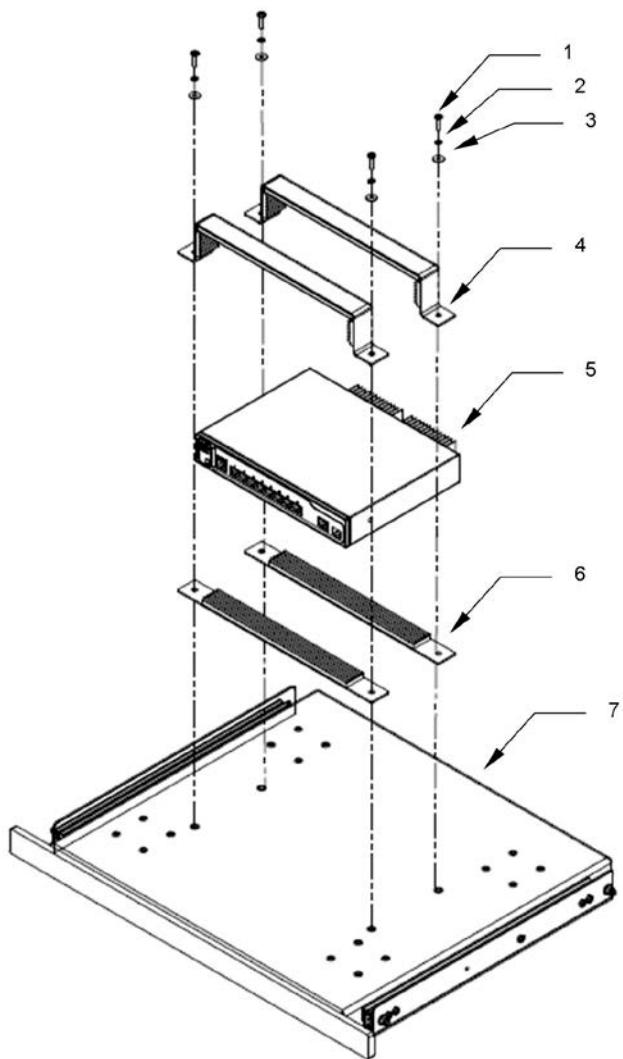
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-13	1	PAFZZ	5305-00-054-5651	39428	MS51957-17	SCREW, Machine, Pan Head	8
8-13	2	PAFZZ	5310-00-782-1349	80205	MS15795-804	WASHER, Flat	16
8-13	3	PAFZZ	5310-01-512-5085	81349	M45913/1-04CS6	NUT, Self-Locking	8
8-13	4	XBFZZ		01365	08020E0099	DIPLEXER BRACKET	1
8-13	5	PAFZZ		3AD70	LH7 88/108 N50	DIPLEXER	2

Figure 8-13. Diplexer Assembly



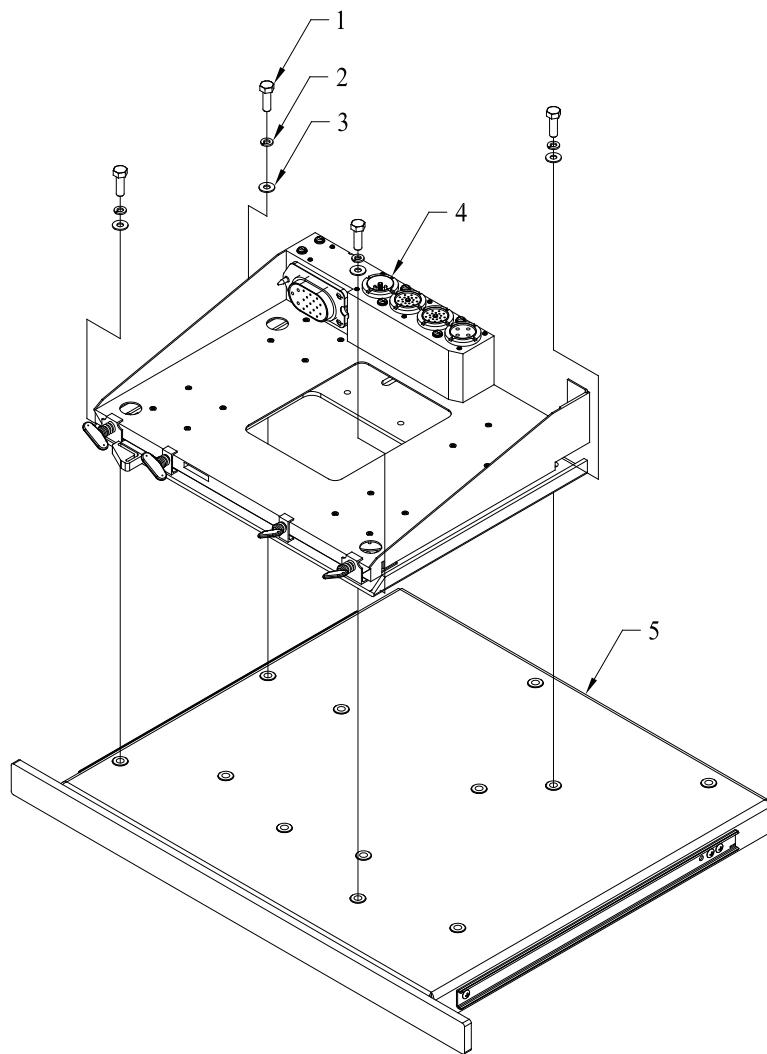
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fig No	Item No	SMR Code	NSN	CAGE	Part Number	Description	Qty
8-14	1	PAFZZ	5305-01-557-0870	0Y3H3	AES01C312A00WA6DG1	BOLT, Machine, Hex Head	4
8-14	2	PAFZZ	5310-00-012-0214	96906	MS35338-26	WASHER, Lock	4
8-14	3	PAFZZ	5310-00-081-4219	96906	MS27183-12	WASHER, Flat	4
8-14	4	PAFZZ	5340-01-167-8297	80063	SM-E-912525	MOUNTING BASE, 6146/VSQ-1	1
8-14	5	XBFZZ		01365	08020E0065	RADIO SHELF	1

Figure 8-14. Enhanced Position Location and Reporting System Mounting Assembly



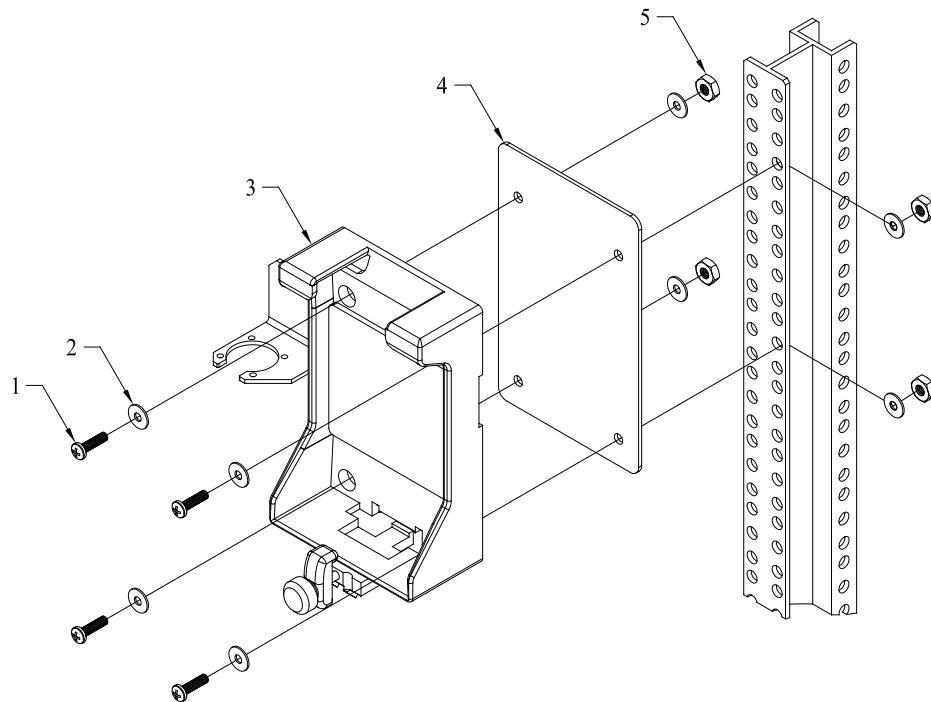
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-15	1	PAOZZ	5305-00-071-1318	96906	MS51957-83	SCREW, Machine, Pan Head	4
8-15	2	PAOZZ	5310-00-933-8121	96906	MS35338-139	WASHER, Lock	4
8-15	3	PAOZZ	5310-00-582-5677	80205	MS15795-810	WASHER, Flat	4
8-15	4	XBOZZ		01365	08020E0098	SWITCH, Bracket	2
8-15	5	PAOZZ	7025-01-564-9545	0GX96	WS-C3560-8PC-S	INTERFACE UNIT, Automatic Data Processing	1
8-15	6	XBOZZ		01365	08020E0117	SWITCH PLATE	2
8-15	7	XBFZZ		01365	08020E0062	COMPUTER SHELF	1

Figure 8-15. Automated Data Processing Interface Unit Assembly



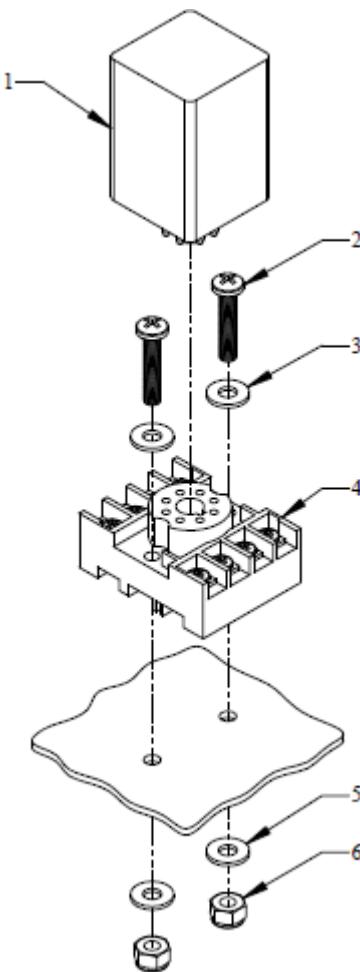
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-16	1	PAFZZ	5305-01-557-0870	0Y3H3	AES01C312A00WA6DG1	BOLT, Machine, Hex Head	4
8-16	2	PAFZZ	5310-00-012-0214	96906	MS35338-26	WASHER, Lock	4
8-16	3	PAFZZ	5310-00-081-4219	96906	MS27183-12	WASHER, Flat	4
8-16	4	PAFZZ	5975-01-188-8873	80063	A3013367-1	MOUNTING BASE, Electrical Equipment MT-6352	1
8-16	5	XBFZZ		01365	08020E0065	RADIO SHELF	1

Figure 8-16. Single Ground-to-Air Radio System Channel Mounting Assembly



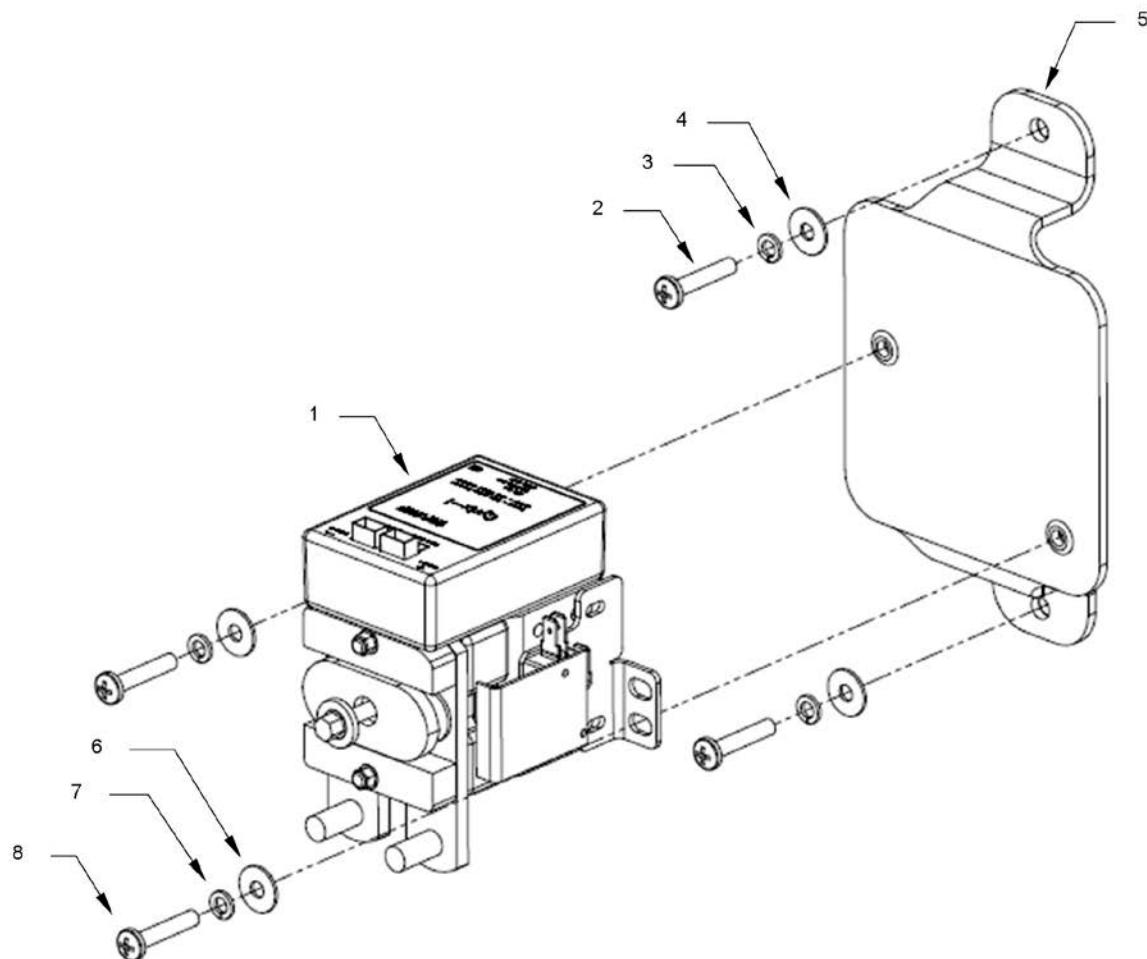
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-17	1	PAOZZ	5305-00-059-3659	39428	MS51958-65	SCREW, Machine, Pan Head	4
8-17	2	PAOZZ	5310-00-225-5328	80205	MS15795-841	WASHER, Flat	8
8-17	3	PAOZZ	5340-01-386-7841	80063	A3006206	BRACKET ASSEMBLY MOUNTING	1
8-17	4	XBOZZ		01365	08020E0075	MOUNTING PLATE	1
8-17	5	PAOZZ	5310-01-521-9560	80205	M45913/1-010FS6	NUT, Self-Locking	4

Figure 8-17. Single Ground-to-Air Radio System Channel User Read Out Mount Assembly



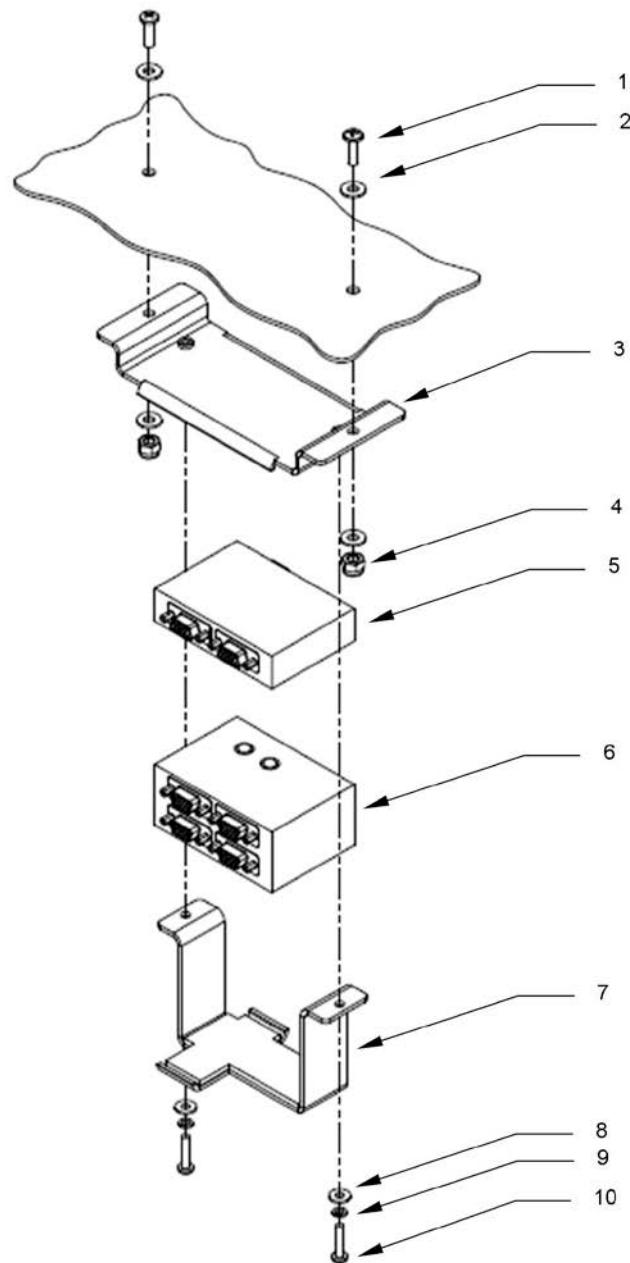
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-18	1	PAFZZ	5945-00-163-3556	14799	8501KPD12V53	RELAY, Electromagnetic	1
8-18	2	PAFZZ	5305-00-054-6675	96906	MS51957-50	SCREW, Machine, Pan Head	2
8-18	3	PAFZZ	5310-00-880-5978	39428	MS15795-807	WASHER, Flat	2
8-18	4	PAFZZ	5935-01-237-5227	56865	8501-NR-51	SOCKET, Plug-in Electronic Components	1
8-18	5	PAFZZ	5310-00-880-5978	39428	MS15795-807	WASHER, Flat	2
8-18	6	PAFZZ	5310-01-512-9061	81349	M45913/1-08CS6	NUT, Self locking, Hexagon	2

Figure 8-18. Relay, Electromagnetic



(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-19	1	PAFZZ		H0L31	CYRIX-I 24/48-400	CONTROL, Battery Charger	1
8-19	2	PAFZZ		80204	AESF5C250AGM7DG1	SCREW, Machine, Pan Head, Cross Recessed	2
8-19	3	PAFZZ		80204	AEW07X250000GY0AS1	WASHER, Lock	2
8-19	4	PAFZZ	5310-00-809-4058	96906	MS27183-10	WASHER, Flat	2
8-19	5	XBDZZ		01365	08020E0106	MOUNTING BRACKET, Battery Combiner	1
8-19	6	PAFZZ		1QNZ3	AEW24X190000GM7A81	WASHER, Flat	2
8-19	7	PAFZZ		80204	AEW7X190000GM7AS1	WASHER, Lock	2
8-19	8	PAFZZ		80204	AESF5C190750GM7DG1	SCREW, Machine, Pan Head, Cross Recessed	2

Figure 8-19. Battery Charger Control

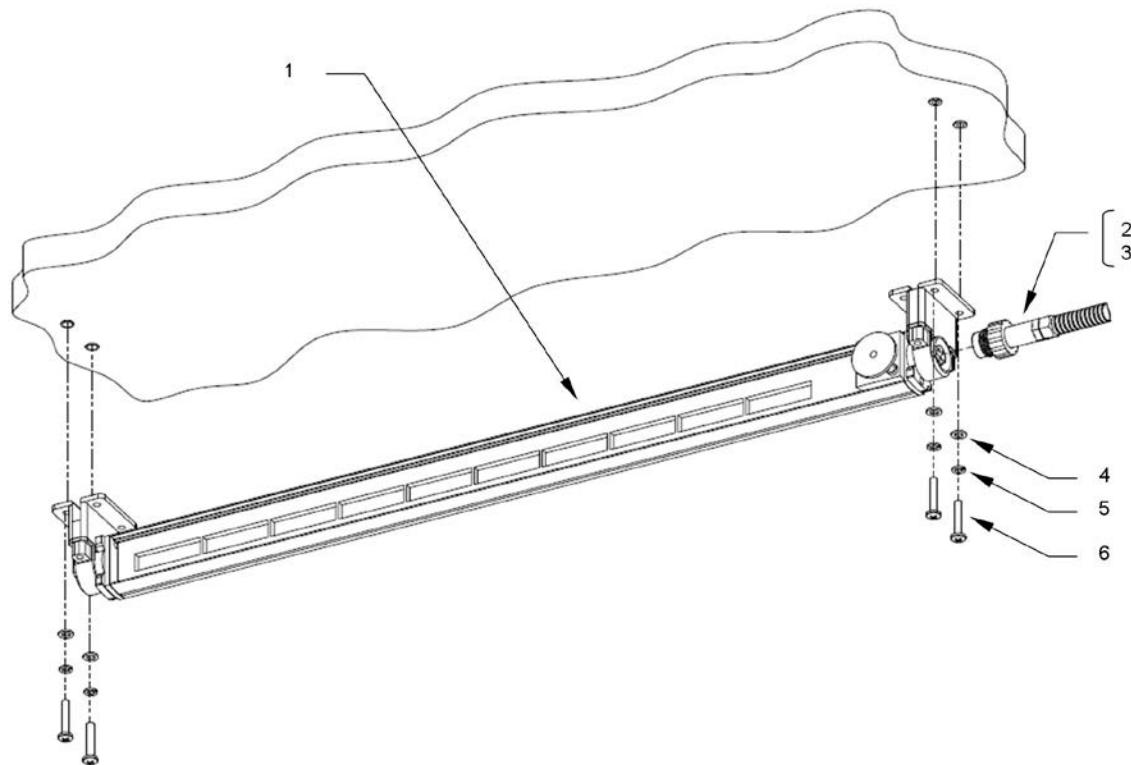


(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-20	1	PAOZZ	5305-00-059-3659	80205	MS519858-63	SCREW, Machine Pan Head	2
8-20	2	PAOZZ	5310-00-225-5328	80205	MS15795-841	WASHER, Flat	4
8-20	3	XBOZZ		01365	08020E0090	TOP BRACKET	1

Figure 8-20. Radio Frequency Power Dividers (Sheet 1 of 2)

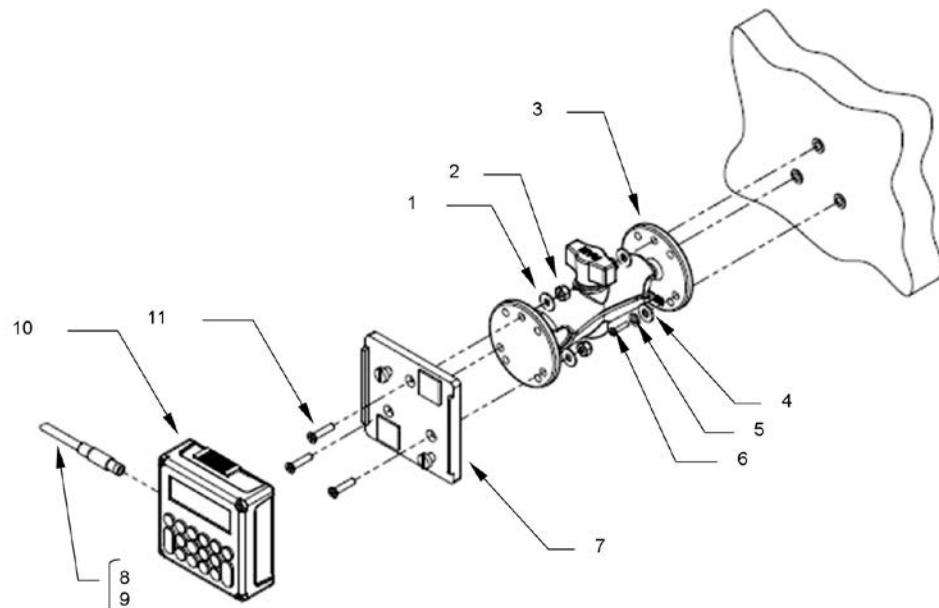
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-20	4	PAOZZ	5310-01-521-9560	81349	M45913/1-010FS6	NUT, Self-locking	2
8-20	5	PAOZZ	5895-01-540-6169	59951	AC1056A-2	DIVIDER, Power Radio, Frequency	1
8-20	6	PAOZZ	5836-01-584-9036	59951	AC1056A-4	DIVIDER, Power, Radio, Frequency	1
8-20	7	XBOZZ		01365	08020E0091	BOTTOM BRACKET	1
8-20	8	PAOZZ	5310-00-225-5328	80205	MS15795-841	WASHER, Flat	2
8-20	9	PAOZZ	5310-01-398-1615	96906	MS35338-138	WASHER, Lock	2
8-20	10	PAOZZ	5310-00-059-3659	80205	MS519858-63	SCREW, Machine, Pan Head	2

Figure 8-20. Radio Frequency Power Dividers (Sheet 2 of 2)



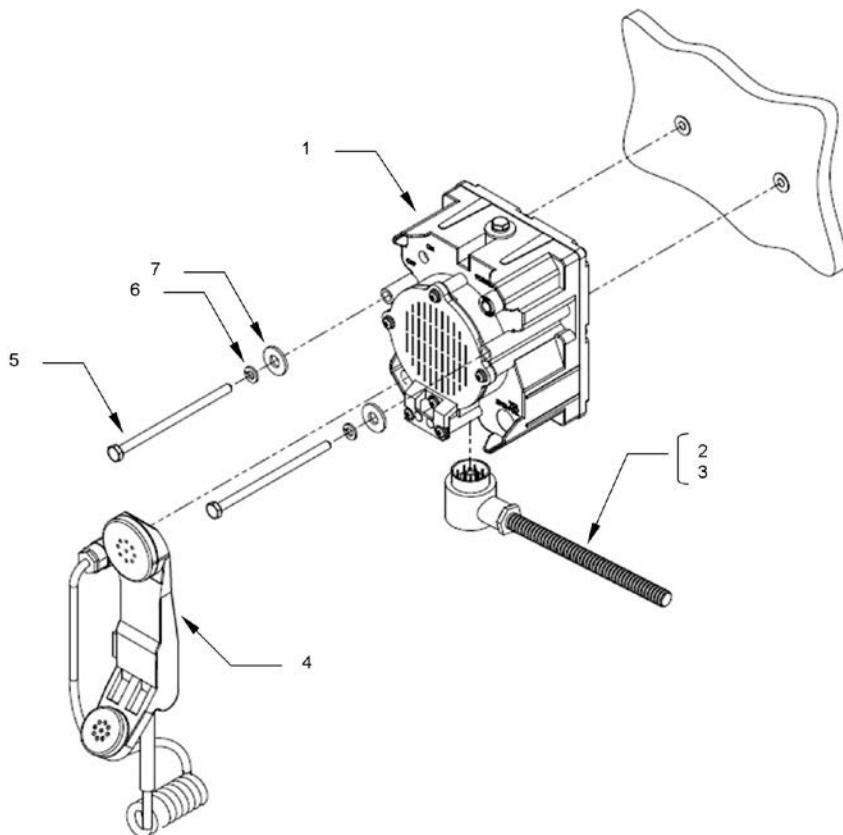
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-21	1	PAOZZ		00MW9	P2152-H-10S	LIGHTING ASSEMBLY	1
8-21	2	PAOZZ		01365	08020B0067-1	CABLE ASSEMBLY, Special Purpose, Electrical, W67-1	1
8-21	3	POAZZ		01365	08020B0067-2	CABLE ASSEMBLY, Special Purpose, Electrical, W67-2	1
8-21	4	PAOZZ	5310-01-312-4959	96906	MS27183-47	WASHER, Flat, No. 10 X .365, YZ	4
8-21	5	PAOZZ		80204	AEW07X190000GM7A S1	WASHER, Lock, No.10, YZ	4
8-21	6	PAOZZ	5305-00-984-6214	80205	MS35206-267	SCREW, Machine, Pan Head, Cross Recessed, No.10-24 X 1.00, YZ	4

Figure 8-21. Overhead Lights



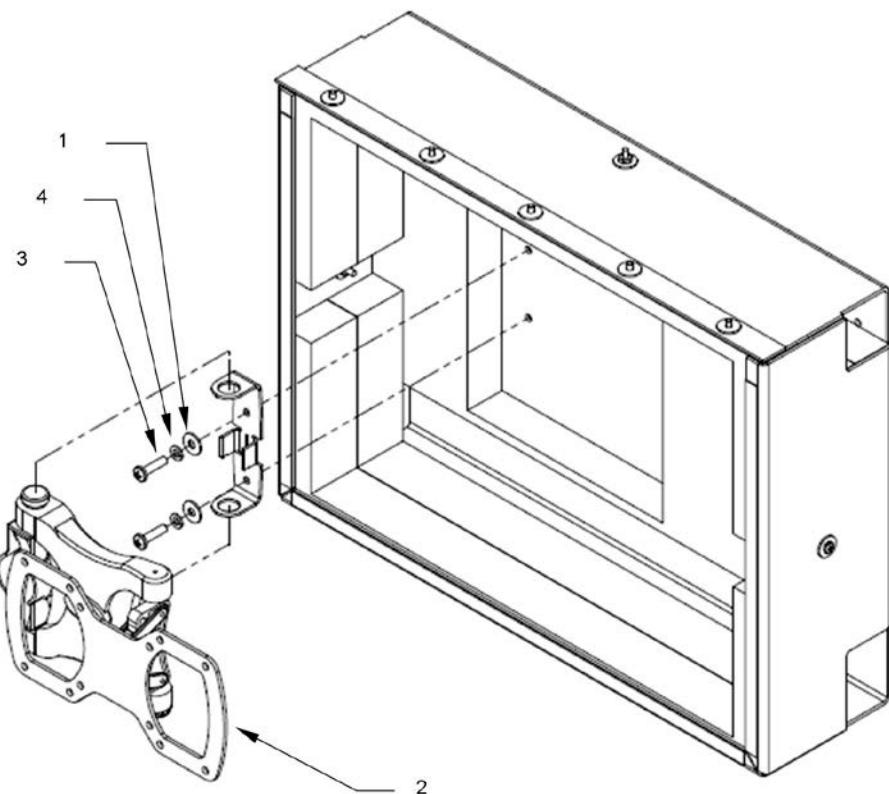
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-22	1	PAOZZ	5310-00-880-5978	96906	MS15795-807	WASHER, Flat, No.8 X .375, SS	3
8-22	2	PAOZZ	5310-01-512-9061	96906	M45913/1-08CS6	NUT, Self-Locking, Hexagon, No.8-32,	3
8-22	3	PAOZZ		4ZDB6	RAM-B-101U	BRACKET, MOUNTING	1
8-22	4	PAOZZ	5310-00-809-8546	96906	MS27183-48	WASHER, Flat, No.10 X .437, YZ	3
8-22	5	PAOZZ		80204	AEW07X190000GM7AS1	WASHER, Lock, No.10, YZ	3
8-22	6	PAOZZ	5305-00-984-6212	80205	MS35206-265	SCREW, Machine, Pan Head, Cross Recessed, No.10-24 X .750, YZ	3
8-22	7	XBOZZ		01365	08020E0101	BRACKET, Keypad Display Unit	1
8-22	8	PAOZZ	5995-01-584-6108	14304	11071-0205-A020	CABLE ASSEMBLY, Special Purpose, Electrical, W80-1	1
8-22	9	PAOZZ	5995-01-584-6108	14304	11071-0205-A020	CABLE ASSEMBLY, Special Purpose, Electrical, W80-2	1
8-22	10	PAODD	7025-01-499-9143	14304	10511-1300-03	DISPLAY UNIT	1
8-22	11	XBOZZ	5305-00-764-0071	80205	MS51959-47	SCREW, Machine, CSK, Cross Recessed, No. 8-32 X .75, SS	3

Figure 8-22. Keyboard Display Unit Mounting Bracket



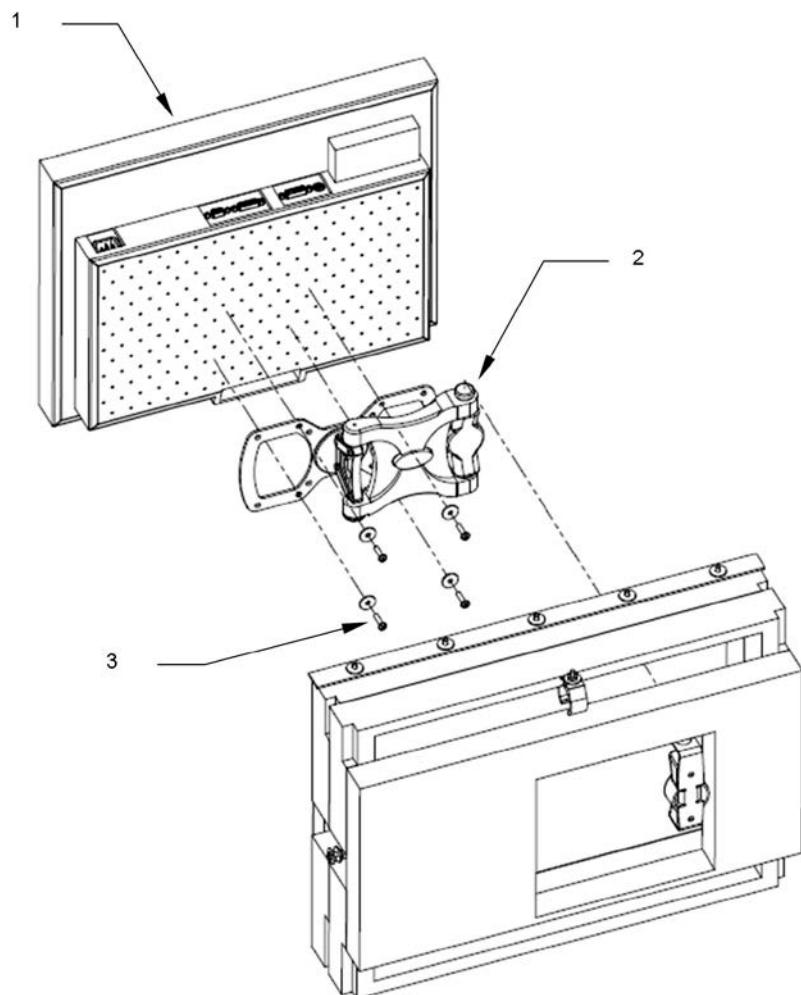
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-23	1	PAODD	5965-01-222-1420	80063	A3014065-1	LOUDSPEAKER CONTROL UNIT LS-671/VRC	1
8-23	2	XBDZZ		01365	08020D0222-1	CABLE ASSEMBLY, Special Purpose, Electrical, W222-1	1
8-23	3	XBDZZ		01365	08020D0222-2	CABLE ASSEMBLY, Special Purpose, Electrical, W222-2	1
8-23	4	PAOZZ	5965-00-043-3463	80063	SM-D-889337	HANDSET, H-250/U	1
8-23	5	PAOZZ		80204	AES01C250D50WA6DG1	SCREW, Cap, Hexagon Head, 1/4-20 X 4.50, YZ	2
8-23	6	PAOZZ		80204	AEW07X250000GY0AS1	WASHER, Lock, 1/4-20, YZ	2
8-23	7	PAOZZ	5310-00-809-4058	96906	MS27183-10	WASHER, Flat, .25 X .625, YZ	2

Figure 8-23. Loud Speaker Unit



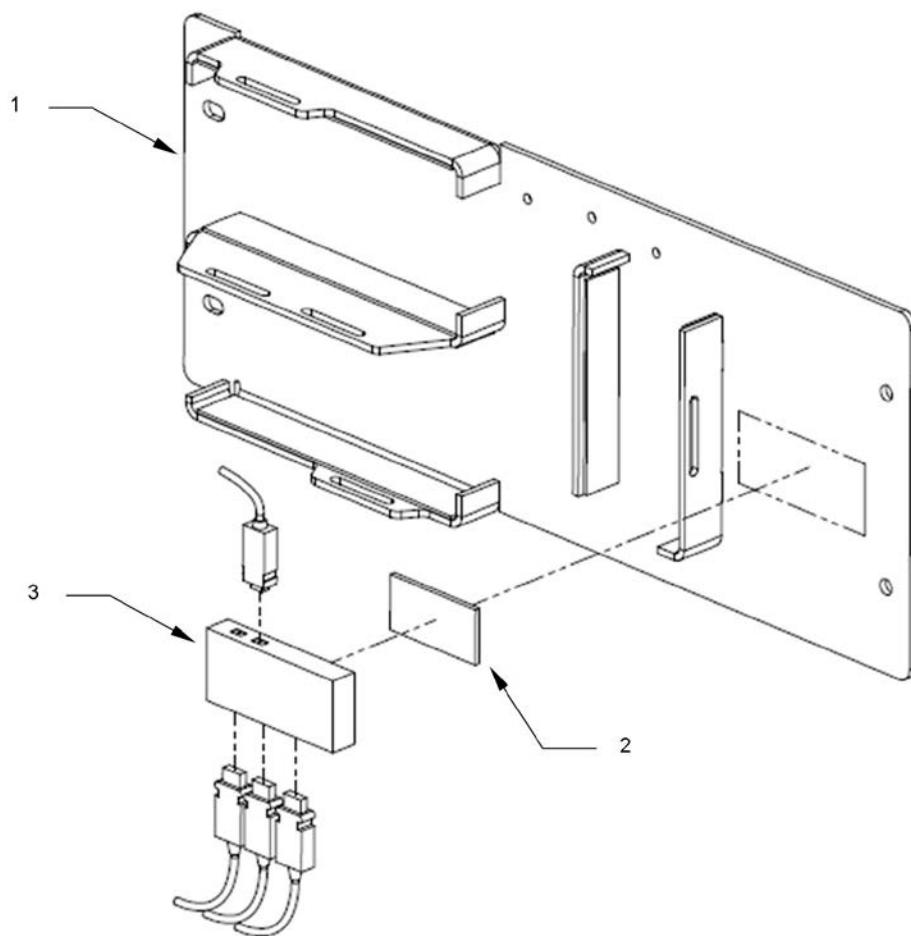
(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-24	1	PAFZZ	5310-00-809-4058	96906	MS27183-10	WASHER, Flat, .25 X .625, YZ	2
8-24	2	XBFZZ		1UXZ3	4N1-S200	BRACKET, Mounting	1
8-24	3	XBFZZ		80204	AESF5C250A00GM7DG1	SCREW, Machine, Pan Head, Cross Recessed, 1/4-20 X 1, YZ	2
8-24	4	PAFZZ		80204	AEW07X250000GY0AS1	WASHER, Lock, 1/4-20, YZ	2

Figure 8-24. Display Unit Mounting Bracket to Shelter



(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-25	1	PAOZZ	7025-01-590-3082	4JC83	LCD2190UXP-BK	DISPLAY UNIT	1
8-25	2	XBFZZ		1UXZ3	4N1-S200	BRACKET, Mounting	1
8-25	3	XBFZZ		4JC83	1D301001	SCREW, Assembled with Lock and Flat Washer NOTE: Supplied with Display Unit	4

Figure 8-25. Display Unit with Mounting Bracket



(1) Fig No	(2) Item No	(3) SMR Code	(4) NSN	(5) CAGE	(6) Part Number	(7) Description	(8) Qty
8-26	1	XBOZZ		01365	08020E0064	POWER CONVERTER BRACKET	1
8-26	2	PAOZZ		39428	94985K815	FASTENER TAPE, Hook and Loop (Self- Adhesive)	AR
8-26	3	PAOZZ		68167	F5U404-PBLK	HUB, Network	1

Figure 8-26. 4-Port USB Hub

APPENDIX A

ACRONYMS AND ABBREVIATIONS

The following table lists acronyms and abbreviations used throughout the manual and their definitions.

Table A-1. Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
AC	Alternating Current
ADP	Automated Data Processing
AFATDS	Advanced Field Artillery Tactical Data System
AGS	Advanced Generator Start
Amp	Ampere
BIT	Built-in Test
BLOS	Beyond-Line-of-Sight
C2	Command and Control
C4I	Command, Control, Communications, Computers, and Intelligence
Cat	Category
CB	Circuit Breaker
CC	Charge Controller
CCW	Counter-clockwise
CD	Compact Disc
COC	Combat Operations Center
COMSEC	Communications Security
CONOPS	Concept of Operations
COTS	Commercial Off-The-Shelf
DC	Direct Current
EMI	Electromagnetic Interference
EPLRS	Enhanced Position Location and Reporting System
ESD	Electrostatic Discharge
F	Fahrenheit
ft.	Foot/feet
GFE	Government Furnished Equipment
GR	Grade
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HCFC	Hydrochlorofluorocarbon

Table A-1 Acronyms and Abbreviations (Continued)

Acronym/ Abbreviation	Definition
HDD	Hard Disk Drive
Hz	Hertz
IAW	In Accordance With
ID	Identification
IP	Internet Protocol
KDU	Keyboard Display Unit
KVM	Keyboard/Video/Mouse
LAN	Local Area Network
lb.	Pound
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
LMS	Lightweight Multipurpose Shelter
LOS	Line-of-Sight
LRU	Lowest Replaceable Unit
MAC	Media Access Control
MAGTF	Marine Air-Ground Task Force
M-B	Multi-band
Mbps	Megabit(s) per second
MCRP	Marine Corps Reference Publication
MHz	Megahertz
mJ	Millijoule
MIL-SPEC	Military Specification
MIL-STD	Military Standard
MOS	Military Occupation Specialties
MPE	Maximum Permissible Exposure
MTBF	Mean Time Between Failure
MTS	Mobile Tactical Shelter
NCOIC	Network Centric Operations Industry Consortium
NSN	National Stock Number
O	Organizational
OSHA	Occupational Safety and Health Administration
OSM	On-screen Menu

Table A-1 Acronyms and Abbreviations (Continued)

Acronym/ Abbreviation	Definition
PCC	Power Conditioner/Converter
PDU	Power Distribution Unit
PMCS	Preventative Maintenance Checks and Services
PMS	Planned Maintenance System
P/N	Part Number
PoE	Power over Ethernet
POST	Power-On Self Test
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
PWB	Printed Wiring Board
RADHAZ	Radiation Hazard
RF	Radio Frequency
RFI	Radio Frequency Interference
ROM	Read-Only Memory
RPSTL	Repair Parts and Special Tools List
R/T	Receiver/Transmitter
RTC	Real-time Clock
RTS	Request to Send (cable)
SATCOM	Satellite Communication
SFP	Small Form-Factor Pluggable
SIM	Subscriber Identity Management
SINCGARS	Single Channel Ground-to-Air Radio System
SMIA	Shock Mount Interface Assembly
SMR	Source, Maintenance, and Recovery
SOP	Standard Operating Procedure
S/W	Software
TIP	Tent Interface Panel
TM	Technical Manual
TPM	Trusted Platform Module
UHF	Ultra High Frequency
URO	User Read Out
US	United States
USB	Universal Serial Bus
V	Volt
VAA	Vehicular Amplifier Adapter

Table A-1 Acronyms and Abbreviations (Continued)

Acronym/ Abbreviation	Definition
VAC	Volts Alternating Current
VAU	Vehicle Adapter Unit
VDC	Volts Direct Current
VGA	Video Graphics Accelerator
VHF	Very High Frequency
VIP	Vehicle Interface Panel
W	Watt

APPENDIX B

EXPENDABLE-DURABLE SUPPLIES AND MATERIAL LIST

B-1. GENERAL INFORMATION.

This appendix lists expendable/durable supplies and materials needed to operate and maintain the system, shown in Table B-1.

B-2. EXPLANATION OF COLUMNS.

- a. Item Number (Column 1). This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material.
- b. Maintenance Levels (Column 2). This column identifies the lowest level of maintenance that requires the listed item.
 - Operational/Crew
 - Field Level
 - Sustainment
- c. National Stock Number (Column 3). The NSN assigned to the item is used to request or requisition the item.
- d. Description (Column 4). This column indicates the Federal Item Name and, if required, a description to identify the item. The last line for each item indicates the part number and CAGE code.
- e. Unit of Measure (Column 5). The U/M indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetic abbreviation (e.g., EA, in). If the U/M differs from the unit of issue, requisition the lowest unit of issue that will satisfy the requirements.

Table B-1. Expendable-Durable Supplies and Materials List

Item Number	Maintenance Levels	NSN	Description	Unit of Measure
1	Operator/Crew	7530-01-335-2623	Paper, Copying, Xerographic Process	EA
2	Operator/Crew	8040-00-145-0020	Adhesive	EA
3	Operator/Crew	6810-00-286-5435	Isopropyl Alcohol, Technical	EA
4	Operator/Crew	1005-00-494-6602	Brush, Cleaning	EA
5	Operator/Crew	7045-01-470-3592	Disk, Nonflexible	EA
6	Operator/Crew	7930-01-398-2473	Canned Air	EA
7	Operator/Crew	8030-01-388-5604	Sealing Compound	EA
8	Field Level	5975-01-526-8849	Strap, Tiedown, Electrical Components	EA
9	Operator/Crew	7510-01-546-6418	Cartridge, Toner	EA
10	Operator/Crew	5920-01-548-5390	Workstation Kit, Electrostatic Control	EA
11	Operator/Crew	7930-01-424-4796	Cleaner, Industrial, Multi Purpose	EA
12	Operator/Crew	3610-00-810-0571	Tissue, Lint Free	EA
13	Operator/Crew	6510-01516-8714	Swabs, Cleaning	EA
14	Operator/Crew	9150-01-260-2534	Lubricant, Solid Film	EA

Table B-1. Expendable-Durable Supplies and Materials List (Continued)

Item Number	Maintenance Levels	NSN	Description	Unit of Measure
15	Operator/Crew	9150-00-826-2740	Lubricant Oil	EA
16	Operator/Crew	6135-00-985-7845	Battery, Nonrechargeable	EA
17	Operator/Crew	4240-00-052-3776	Goggles, Industrial	EA
18	Operator/Crew	7520-01-352-7321	Marker Assortment, Tube Type	EA
19	Operator/Crew	8415-00-009-1900	Gloves, Chemical and Oil Protective	EA
20	Field Level	9150-01-197-7690	Grease, Automotive and Artillery	EA
21	Field Level	8305-00-962-2027	Cloth, Cotton, Muslin	EA
22	Field Level	8030-00-753-5005	Sealing Compound	EA
23	Field Level	8040-01-562-8057	Adhesive	EA
24	Field Level	9150-00-281-1893	Soap, Lubricating	EA

APPENDIX C

COMPONENTS OF END ITEM LIST

C-1. SCOPE.

This Appendix lists the components of the end item (COEI) (Table C-1) for the SHELTER EXPANDABLE (Mobile Tactical Shelter (MTS)), AN/TSQ-272 to help the operator inventory items required for safe and efficient operation.

C-2. GENERAL.

This Appendix lists all components and accessories for collection-type supply items, such as major combinations, systems, groups, outfits, kits, sets or assortments.

The components to be issued with the end item are identified under the heading of “SUPPLY SYSTEM RESPONSIBILITY” and when required, under the heading “COLLATERAL MATERIEL.” End items requiring collateral materiel are governed by whether the end item is an initial or replacement issue. After initial issue, as directed by Commander, Marine Corps Systems Command, the Program Manager will direct whether subsequent issue of the end item is with or without collateral materiel.

Those items listed under the “USING UNIT RESPONSIBILITY” heading, are to be requisitioned separately through the supply system, when applicable. Using Units are also responsible for requisitioning the required publications to support the end item identified by the ID number associated to the national stock number for this item. The end item will be complete when the total quantity of items, as applicable shown in the components of end item list are on hand.

C-3. LIST OF COMPONENTS.

This listing comprises the major portion of this publication. The data, arranged in columnar form, present the information needed to identify the item and determine its type of issue.

- a. Item Number (Column 1). This column specifies a number assigned to each item as it appears in the list. Numbers are assigned in sequence and are for reference purposes only.
- b. Stock Number (Column 2). This column furnishes the National Stock Number (NSN) assigned to the item.
- c. Reference Designator/Figure-Key (Column 3). This column contains alphabetical and/or numerical designators for referencing individual component or item to an illustration. The absence of a reference designator indicates there is no illustration for the item.
- d. Item Identification (Column 4). This column provides the item name and description listed under the heading of either “SUPPLY SYSTEM RESPONSIBILITY,” “COLLATERAL MATERIEL” or “USING UNIT RESPONSIBILITY” in alphabetical order. If required, sub-headers can be inserted under the above listed headers for arrangement of components, in alphabetical order under the sub-head, to allow for better inventory (See paragraphs 12, 13, and 14).
- e. Unit of Measure (Column 5). This column gives the measurement standard of each item. It may or may not be the same as the unit of issue. For example, the unit of issue of a certain wire is coil but only four (4) feet are required for the end item. Therefore, the unit of measure shown will not be used for requisitioning purposes. For the proper unit of issue and other required management data, refer to the applicable Management Data List (MDL) when requisitioning.

f. Quantity Used in Unit (Column 6). This column lists the total quantity of an item, according to the unit of measure required, for full functional operation of the end item.

C-4. SUPPLY SUPPORT CATEGORIES.

a. Supply System Responsibility (SSR). A list, in alphabetical sequence, of items that are furnished with and must be turned in with the end item. Any item requiring replacement is the responsibility of the holding organization or using unit.

b. Collateral Materiel. A list, in alphabetical sequence, of items that are supplied with the **initial** issue of the end item and are retained by the unit. The “9999-xx-xxx-xxxx” NSN shown under the heading of “COLLATERAL MATERIEL” (if applicable) is for control within the distribution system only, and **is not authorized** for requisitioning purposes.

c. Using Unit Responsibility (UUR). A list, in alphabetical sequence, of items that will not be issued with the end item. They must be requisitioned, as required, through the supply system by the using unit or holding organization.

C-5. EXPLANATION OF COLUMNS.

The following provides an explanation of columns found in the tabular list:

a. Item Number (Column 1). This column specifies a number assigned to each item as it appears in the list. Numbers are assigned in sequence and are for reference purposes only.

b. Stock Number (Column 2). This column furnishes the National Stock Number (NSN) assigned to the item.

c. Reference Designator/Figure-Key (Column 3). This column contains alphabetical and/or numerical designators for referencing individual component or item to an illustration. The absence of a reference designator indicates there is no illustration for the item.

d. Item Identification (Column 4). This column provides the item name and description listed under the heading of either “SUPPLY SYSTEM RESPONSIBILITY,” “COLLATERAL MATERIEL” or “USING UNIT RESPONSIBILITY” in alphabetical order. If required, sub-headers can be inserted under the above listed headers for arrangement of components, in alphabetical order under the sub-head, to allow for better inventory.

e. Unit of Measure U/M (Column 5). This column gives the measurement standard of each item. It may or may not be the same as the unit of issue. For example, the unit of issue of a certain wire is coil but only four (4) feet are required for the end item. Therefore, the unit of measure shown will not be used for requisitioning purposes. For the proper unit of issue and other required management data, refer to the applicable Management Data List (MDL) when requisitioning.

f. Quantity Used in Unit (Column 6). This column lists the total quantity of an item, according to the unit of measure required, for full functional operation of the end item.

C-6. COMPONENTS OF END ITEM LIST.**Table C-1. Components of End Item**

Item Number	National Stock Number	REF DESIG/FIG-KEY	Item Identification	U/M	Qty
			SUPPLY SYSTEM RESPONSIBILITY		
1	4120-01-581-2650		AIR CONDITIONER: PN GSQ386ZABNW0011 CAGE 0WJE1; c/o	EA	1
2	6150-01-560-7170		1 – CABLE ASSEMBLY, Special Purpose, Electrical, W68: (Air Conditioner Power Cord 10 feet); PN 108-00047 CAGE 0WJE1	EA	
3	4130-01-560-7173		1 – COVER, Air Conditioner: PN 112-00014 CAGE 0WJE1	EA	
			OR		
4	4120-01-552-5223		AIR CONDITIONER: PN GSQ346ZABNW00G1 CAGE 0WJE1; c/o	EA	1
5	6150-01-560-7170		1 – CABLE ASSEMBLY, Special Purpose, Electrical, W68: (Air Conditioner Pwr Cord 10 feet); PN 108-00047, CAGE 0WJE1	EA	
6	4130-01-560-7173		1 – COVER, Air Conditioner: PN 112-00014 CAGE 0WJE1	EA	
7	5820-01-183-9462		ANTENNA, AS-3449/VSQ-1 (EPLRS): PN A3005031 CAGE 80063	EA	1
8	5985-01-537-8837		ANTENNA VEHICULAR, AS-390A/VRC (Multi-band): PN RF-390-AT005 CAGE 14304	EA	4
9			BRACKET, Mounting: (Display Monitor); PN 4N1-S CAGE 1UXZ3	EA	4
10			CABLE ASSEMBLY, Radio Frequency, W4: (Frt. Ant, RF to passthru); PN 08020C0004-1 CAGE 01365	EA	2
11			CABLE ASSEMBLY, Radio Frequency, W4: (Rear Ant., RF to passthru); PN 08020C0004-3 CAGE 01365	EA	2
12			CABLE ASSEMBLY, Radio Frequency, W5: (EPLRS RF to passthru); PN 08020C0005-1 CAGE 01365	EA	1

Table C-1. Components of End Item (Continued)

Item Number	National Stock Number	REF DESIG/ FIG-KEY	Item Identification	U/M	Qty
13			CABLE ASSEMBLY, Special Purpose, Electrical, W201: (Shelter - Generator Pwr Input); PN 08020D0201 CAGE 01365	EA	1
14			CABLE ASSEMBLY, Special Purpose, Electrical, W218: (Shelter Grd); PN 08020D0218 CAGE 01365	EA	1
15			CABLE ASSEMBLY, Special Purpose, Electrical, W226: (Shelter to Veh. Pwr.); PN 08020D0226 CAGE 01365	EA	1
16			CABLE ASSEMBLY, Special Purpose, Electrical, W232: (VIP to Veh. Radio); PN 08020D0232-1 CAGE 01365	EA	1
17			CABLE ASSEMBLY, Special Purpose, Electrical, W232: (VIP to Veh. Radio); PN 08020D0232-2 CAGE 01365	EA	1
18			CABLE ASSEMBLY, Special Purpose, Electrical, W252: (Generator Pigtail); PN 08020D0252 CAGE 01365	EA	1
19			CONTROL, Battery Charger: PN CYRIX-i24/48-400 CAGE H0L31	EA	1
20	7025-01-590-3082		DISPLAY UNIT: (Monitor); PN LCD2190UXP-BK CAGE 4JC83; c/o	EA	4
21			4 – CABLE ASSEMBLY, Special Purpose, Electrical, W63: (Pwr); PN 7A083011 CAGE 4JC83	EA	
22	5895-01-540-6169		DIVIDER, Power, Radio Frequency: PN AC1056A-2 CAGE 59951; c/o	EA	1
23			1 – CABLE ASSEMBLY, Special Purpose, Electrical, W61-2: (Pwr); PN PW3-05020-B3A CAGE 59951	EA	
24	5836-01-584-9036		DIVIDER, Power, Radio Frequency W61-1: (Pwr); PN AC1056A-4 CAGE 59951; c/o	EA	1
25			1 – CABLE ASSEMBLY, Special Purpose, Electrical: PN PW3-05020-B3A CAGE 59951	EA	

Table C-1. Components of End Item (Continued)

Item Number	National Stock Number	REF DESIG/ FIG-KEY	Item Identification	U/M	Qty
26	5965-00-043-3463		HANDSET, H-250/U: PN SM-D-889337 CAGE 80063	EA	2
27			INDICATOR, Digital Display: (Outback Inverter); PN MATE 2 CAGE 3YMC5; c/o	EA	1
28	7025-01-564-9545		INTERFACE UNIT, Automatic Data Processing: (Cisco Switch); PN WS-C3560-8PC-S CAGE 0GX96; c/o	EA	1
29			1 – CABLE ASSEMBLY, Special Purpose, Electrical: (Pwr); PN CAB-RPS-2300 CAGE 0GX96	EA	
30	5965-01-222-1420		LOUDSPEAKER-CONTROL UNIT, LS-671/VRC: PN A3014065-1 CAGE 54736	EA	2
31	5340-01167-8297		MOUNTING BASE, MT 6146/VSQ-1: (EPLRS); PN SM-E-912525 CAGE 80063	EA	1
32	5975-01-188-8873		MOUNTING BASE, MT 6352/VRC: (VRC-110); PN A3013367-1 CAGE 80063	EA	1
33			POWER SUPPLY: (Outback Inverter); PN OBXG-IC2524P-120/60 CAGE 3YMC5	EA	1
			COLLATERAL MATERIEL		
34			SHOCK MOUNT: (AFATDS Mounting Tray); PN 08020E0063 CAGE 01365	EA	2
35	7025-01-499-9143		DISPLAY UNIT: (KDU DISPLAY); PN 10511-1300-03 CAGE 14304	EA	2

Table C-1. Components of End Item (Continued)

Item Number	National Stock Number	REF DESIG/ FIG-KEY	Item Identification	U/M	Qty
			USING UNIT RESPONSIBILITY		
			NOTE: Using units should refer to the SL-1-2 and requisition the required publications to support the Item identified by the ID number shown on the cover of this SL-3		
36	6140-01-485-1472		BATTERY STORAGE: (Hawker Armasafe Plus); PN 9750N7025 CAGE 0WY95	EA	2
37	2530-01-553-3162		BOOT, Vehicular Components: PN 61B0050D CAGE 0JKN0	EA	1
38	5411-01-499-5433		EXTENSION KIT, Pintle: PN 17-1-8565-1 CAGE 81337	EA	1
39	4020-00-908-6416		FIBER ROPE ASSEMBLY, Single Leg (Antenna Tiedown): PN SC-C-208747 CAGE 80063	EA	4
40	4210-00-270-4512		FIRE EXTINGUISHER: PN 45100 CAGE 57658	EA	1
41	5820-012631-1760		GROUNDING KIT, Surface Wire, MK-2551 A/U: PN SC-D-681610 CAGE 80063	KT	1
42			INDICATOR, Carbon Monoxide: PN 900-0233 CAGE 0J0S5	EA	1
43	5895-01-483-6347		KEYBOARD, Data Entry: PN 434821-001 CAGE 3EVT6	EA	2
44	5440-01-546-7763		LADDER, Extension: PN 7041036-501 CAGE 29381	EA	1
45			LIGHT, Panel (Flexible Neck): PN 18XR-4-LED CAGE 64777	EA	2
46			MOUNTING KIT, Shelter: PN 7047143 CAGE 29381	EA	1
47	7025-01-567-2409		MOUSE, Data Entry: PN DC172B CAGE 1HQN9	EA	2
48			PLOTTING BOARD: PN EP6036A CAGE 76381	EA	1
49	3990-01-204-3009		TIE-DOWN, Cargo, Vehicle: PN MIL-PRF-71224-1 CAGE 0KHZ6	EA	4

APPENDIX D

MOBILE TACTICAL SHELTER INSTALLATION TO VEHICLE

D-1. INTRODUCTION.

The primary reference for performing this action is TM 10-5411-235-13&P Addendum. The secondary references for performing this action is TB 9-2320-335-13&P, TM 11033-OR, TM 9-2320-387-24, and TM 11033-INP. This Appendix provides supplemental information not found in the primary and secondary references.

D-2. PRE-INSTALLATION REQUIREMENTS.

Mating the Mobile Tactical Shelter (MTS) to a M1152 prime mover requires tools and parts listed in Tables D-1 through D-4. Before installing the MTS, assemble the following tools and materials:

Table D-1. Tool List, MTS Installation

Tool	Description
Allen Socket Wrench	5/16"
Standard Socket 1/4 "	5/16", 3/8"
Standard Socket 3/8 "	3/8", 7/16", 1/2", 9/16", 5/8", 3/4"
Standard Socket 1/2"	7/16", 1/2", 9/16", 5/8", 3/4", 3/4" Deep well
Ratchet	1/4" Drive, 3/8" Drive, 1/2" Drive
Breaker Bar	1/2"
Adapter	1/2" to 3/8"
Extension 3/8" drive	6", 12"
Extension 1/2" drive	2.5", 5"
Wrench Combination	5/16", 3/8", 7/16", 9/16", 5/8", 3/4"
Drill	Power, Adjustable Chuck
Drill Bit	1/4"
Torque Wrench	10 ft-lbs, 90 ft-lbs
Screwdriver	#2 Cross-tip

Table D-2. Major Parts List, MTS Installation

Item No	NSN	CAGE	Part Number	Description	Qty
1	5411-01-581-2654	01365	0820G0000	SHELTER EXPANDABLE, (Mobile Tactical Shelter) AN/TSQ-272	1
2	2320-01-540-2007	19207	87T0146	TRUCK, UTILITY, Expanded Capacity Enhanced, IAP/Armor Ready M1152A1 W/B2 Armor Kit	1
3	5411-01-499-5433	81337	17-1-8565-1	EXTENSION KIT, Pintle	1
4		29381	7047143	MOUNTING KIT, Shelter	1

Table D-3. Pintle Extension Kit Parts List

Item	NSN	Nomenclature or Description	Part Number	Quantity
1	5310-00-809-5998	WASHER	MS27183-18	4
2	5310-00-809-4058	WASHER	MS27183-10	2
3	5310-00-696-5173	NUT	17-1-6871-2	6
4	5310-01-016-0720	NUT	17-1-6871-1	1
5	5305-00-984-6193	SCREW	MS35206-245	1
6	5305-01-502-2638	SCREW	B1821BH050C575N	4
7	5305-00-071-2078	SCREW	B1821BH050C375N	4
8	5305-00-071-2067	SCREW	B1821BH050C125N	4
9	5310-00-488-3889	NUT	MS51943-39	12
10	5305-01-016-4344	SCREW	MS51849-95	4
11	5310-00-584-5272	LOCKWASHER	MS35338-48	8
12	5315-00-846-0126	COTTER PIN	MS24665-628	1
13	5340-00-057-2906	CLAMP	MS21333-73	1
14	5310-00-515-8776	WASHER	MS20002-20	3
15	5340-01-536-9852	CLAMP BRACKET	17-1-8579-1	2
16	5340-01-500-1208	CLAMP BRACKET	17-1-8578-1	1
17	5340-01-500-1251	RECEPTACLE BRACKET	17-1-8577-1	1
18	5340-01-500-1205	PINTLE PLATE	17-1-8576-1	1
19	2540-01-500-3206	PINTLE EXTENSION	17-1-8568-1	1

Table D-4. Shelter Mounting Kit Parts List

Item	NSN	Nomenclature or Description	Part Number	Quantity
1		BRACKET, Rear Mounting	7047997-501	1
2		BRACKET, Rear Mounting	7047997-502	1
3		ADAPTER, Mounting	7048008-501	1
4		ADAPTER, Mounting	7048008-502	1
5	5342-01-494-1414	ISOLATOR, Mounting Installation	17-1-3607-1	20*
6	5310-01-493-7690	WASHER, Isolator Mount	17-1-3605-2	6
7		WASHER, Isolator Mount	17-4-3606-1	28
8	5310-00-167-0806	WASHER, Flat	NAS1149C0863R	38
9	5310-01-582-3170	NUT, Hex, Self-Locking	17-2-0488-1	8
10	5365-01-423-4059	SPACER	NAS43HT8-156	14
11	5305-00-410-6957	SCREW, Hex Head	B1821BH050F475N	14
12	5340-01-527-9794	MOUNTING KIT BAR ASSEMBLY	17-1-3597-1	2
13	5305-00-021-3620	SCREW, Hex Head	MS35307-307	6
14	5310-00-582-5677	WASHER, Flat	MS15795-810	6
15	5310-00-933-8121	WASHER, Lock	MS35338-139	6
16	5305-00-576-5417	SCREW, Hex Head	MS35307-360	34
17	5310-00-984-7042	WASHER, Lock	MS35338-141	42
18	5310-01-389-7976	WASHER, Flat	MS15795-814	42
19	5305-00-208-1429	SCREW, Hex Head	MS35307-363	4
20	5305-00-721-5665	SCREW, Hex Head	MS35307-361	4
21	5305-00-071-2069	SCREW, Hex Head	B1821BH050C150N	4
22	5310-00-584-5272	WASHER, Lock	MS35338-48	4
23	5310-00-004-3099	NUT	MS51967-14	4
24	5340-01-527-8908	BRACKET, Clamping	17-1-8245-1	2
25		Deleted		

Table D-4. Shelter Mounting Kit Parts List (Continued)

Item	NSN	Nomenclature or Description	Part Number	Quantity
26	5365-01-527-9273	SPACER	17-1-8243-1	6
27	5310-00-913-8881	NUT	MS51971-3	4
28	5340-01-494-0521	BRACKET, Tail Light	17-1-8246-1	2
29	5325-01-493-7956	GROMMET	17-1-6854-1	2
30	5305-00-071-2078	SCREW, Hex Head	B1821BH050C375N	8
31		ANGLE ASSEMBLY	7047135-501	1
32		ANGLE ASSEMBLY	7047135-502	1
33	5310-01-493-7694	WASHER, Isolator Mount	17-1-3605-1	
34	5310-01-555-0024	WASHER, Lock	MS35338-143	10
35		ADHESIVE, (LOCTITE), Not Provided	AN0321	
36	5306-00-579-5702	BOLT-Machine, Aircraft	AN8C7A	8
37	5305-00-021-3806	SCREW, Hex Head	MS35307-413	10
38		Deleted		
39		Deleted		
40		TAILLIGHT EXTENSION INSTALLATION	7040189-501	2

NOTE

The following table of supplemental material is provided as additive information to Table D-3 and Table D-4. Installation step descriptions use supplemental material descriptions where original technical information was found deficient

Table D-5. Mounting and Pintle Kit Supplemental Material List

Item	Kit	NSN	Nomenclature or Description	Part Number	Quantity
1	MOUNTING	5305-00-071-2067	SCREW, Cap, Hex Head .5 x 1.25 GR 8	B1821BH050C125N	10
2	MOUNTING	5305-00-719-5273	SCREW, Cap, Hex Head .5 x 4.25 GR 8	B1821BH050F425N	2
3	PINTLE	5305-00-071-2070	SCREW, Cap, Hex Head .5 x 1.75 GR 8	B1821BH050C175N	4

CAUTION

Pneumatic tools shall not be used during installation or removal process. Severe damage to equipment could result.

NOTE

- The instruction in this Appendix describes the installation of the MTS to an M1152 HMMWV.
- Prior to performing installation procedures, inventory kits per this Appendix.

D-3. VEHICLE PREPARATION.

1. Move vehicle to assigned integration work area.
2. Ensure vehicle transmission is in park and parking brake is set.
3. Turn off vehicle.

4. Place wheel chocks in front of and behind vehicle wheel.

D-4. PREPARING THE M1152.



Figure D-1. Batteries Under Curbside Seat

CAUTION

To prevent damage to equipment, lubricate all screws and bolts prior to installation and removal.

a. Vehicle Preparation

- (1) Refer to Figure D-1 to view batteries located under curbside seat.
- (2) Remove curbside seat from vehicle by unlatching two front seat latches.
- (3) Slide seat out of rear bracket groove and remove from vehicle.
- (4) Using a 1/2 inch wrench, disconnect negative cable, then positive cable from battery posts.
- (5) Cover cable terminals with a non-conductive material.
- (6) Disconnect cable from Single Channel Ground-to-Air Radio System (SINCGARS) antenna located on curbside wheel well.
- (7) Using a 1/2 inch socket with 3/8 inch drive ratchet remove SINCGARS antenna assembly from curbside wheel well.



Figure D-2. Connector Flush with Grommet

- (8) Push excess antenna cable back into wheel well until connector is flush with grommet (refer to Figure D-2).
- (9) Repeat steps (6) through (8) if antenna is installed on roadside wheel well.
- (10) Using two 9/16 inch sockets, two 3/8 inch drive ratchets, and one 3/8 inch drive extension (12 inches), remove tailgate by removing six 3/8 inch-16 x 1-3/4 inch hex cap screws from hinges.
- (11) Retrieve hinge spacers, located between hinge and truck bed, when removing door.



Figure D-3. Rear Mudflaps

- (12) Using a 3/4 inch wrench and 3/4 inch socket with 1/2 inch drive ratchet, remove both rear mudflaps (refer to Figure D-3). Retain for reuse to install rear vehicle shelter mount. Refer to TB 9-2320-335-13&P.

(13) Using a 3/4 inch wrench and 3/4 inch socket with 1/2 inch drive ratchet, remove two outboard screws next to bumper lift hooks. Retain for reuse to install rear vehicle shelter mount.

(14) Remove roadside troop door by lifting door out of hinges.



Figure D-4. Roadside Upper Troop Seat Bracket

(15) Using a 1/2 inch socket with 3/8 inch drive ratchet, remove roadside upper troop seat bracket (refer to Figure D-4).

(16) Using a 1/2 inch socket, 7/16 inch socket, and 3/8 inch drive ratchet, remove roadside lower troop seat bracket.

(17) Reinstall mounting hardware (it is used to support armor plating).

(18) Using a 9/16 inch socket with 1/2 inch drive ratchet, loosen top door hinge screw.

(19) Using a 9/16 inch socket with 1/2 inch drive ratchet, remove remaining four hinge screws and remove hinge.

(20) Reinstall five mount screws.

(21) Repeat steps (10) through (15) for curbside vehicle preparation.

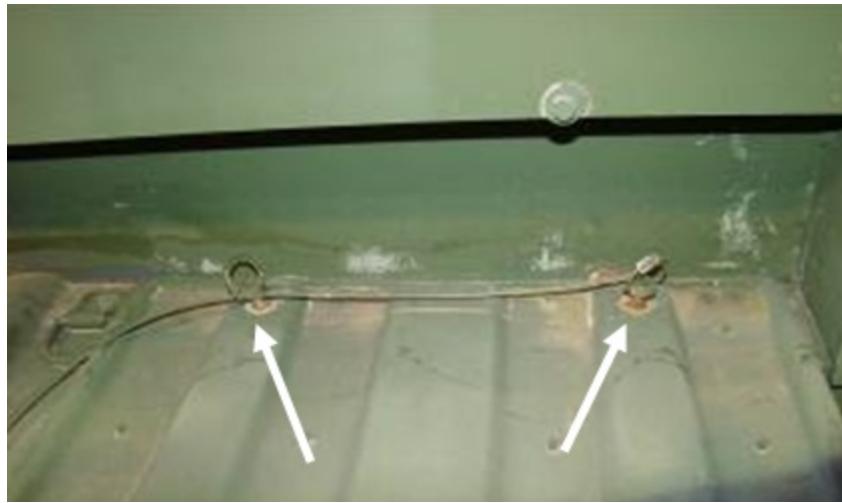


Figure D-5. Floor Panel Quick Release Knobs

(22) Remove roadside and curbside rear-cab floor panels by disconnecting quick release knobs on each panel (refer to Figure D-5). Refer to TB 9-2320-335-13&P.



Figure D-6. Armor Access Panels

(23) From the interior of vehicle, use a 7/16 inch socket and 1/4 inch drive ratchet to remove armor access panels located behind roadside and curbside seats (refer to Figure D-6).

(24) Bag and retain hardware for reinstallation.

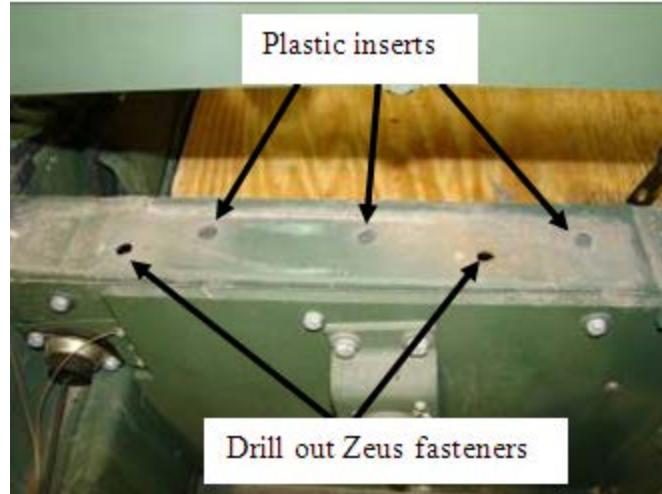


Figure D-7. Armor Panel Mounting Frame

- (25) Remove plastic insert caps in holes along frame where armor panels are installed (refer to Figure D-7).
- (26) Using a 1/4 inch bit, drill out rivets to remove Zeus fasteners attached to frame (refer to Figure D-7).

NOTE

Hex nuts are located in interior of vehicle under support beams behind roadside and curbside seats.

- (27) Using a 5/16 inch hex socket and a 3/4 inch wrench, remove two D-rings in forward end of rear cab.

D-5. REMOVING REAR TAILLIGHTS.



Figure D-8. Taillight Removal

a. Removing Rear Taillights

(1) From interior wheel well, using a 9/16 inch wrench with 3/8 inch drive ratchet, remove two hex cap screws attaching taillights to cover (refer to Figure D-8).



Figure D-9. Cable Guard

(2) Using a 5/16 inch wrench and 5/16 socket with 1/4 drive ratchet, remove inboard P-clamp securing cables to cable guard. (refer to Figure D- 9)

(3) Discard cover guard and associated hardware.

Table D-6. Taillight Wire Numbers

Left Rear		Right Rear	
Wire #	Harness #	Wire #	Harness #
21C	P-1	21E	P-1
224/61B	P-2	224/60C	P-2
23B	P-3	23D	P-3
24B	P-4	24C	P-4

(4) When disconnecting taillight cables from cable harness, annotate wire numbers and retain information for reconnection (refer to Table D-6).

(5) Disconnect taillight from wire harness and remove light assembly.

(6) Reinstall mount screws and grounding plate on back of light and set aside for later reinstallation.

D-6. INSTALLING THE PINTLE EXTENSION.

a. Pintle Extension

(1) Remove cotter pin from pintle using needle-nose pliers.



Figure D-10. Removing Pindle from Bracket

- (2) Remove castellated nut and slide pindle out of bracket (refer to Figure D-10).

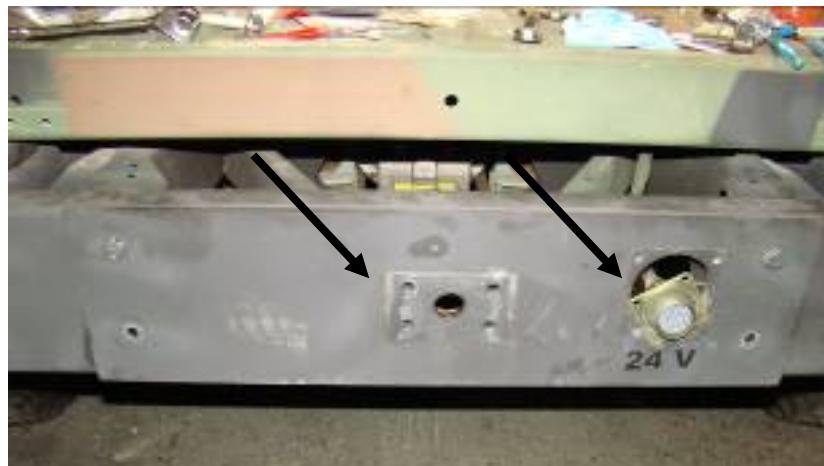


Figure D-11. Pindle Bracket and Receptacle Cover Removed

(3) Using a 3/4 inch wrench and 3/4 inch socket with 1/2 inch drive ratchet, remove four hex cap screws attaching pindle bracket to reinforcement plate (refer to Figure D-11).

(4) Using a 7/16 inch wrench and 7/16 inch socket with 1/4 inch drive ratchet, remove power receptacle cover from bumper.

(5) Using a 3/4 inch wrench and 3/4 inch socket with 1/2 inch drive ratchet, remove four hex cap screws attaching reinforcement plate to bumper.

(6) Leave two upper screws in place to prevent plate from dropping and remove two lower screws.

(7) Firmly hold plate and remove two upper screws.

NOTE

All hardware for build-up of pindle extension will be provided in Extension Kit,
Pindle (PN 17-1-8565).



Figure D-12. Extension Arm and Hardware

(8) Install pintle on pintle extension from Extension Kit, Pintle (PN 17-1-8565) using the following hardware (refer to Figure D-12):

- Screw (4 ea) PN B1821BH050C375N
- Washer (4 ea) PN MS 27183-18
- Washer (4 ea) PN MS 35338-48
- Nut (4 ea) PN MS 51943-39
- Washer (3 ea) PN MS 20002-20
- Pintle Plate(1 ea) PN 17-1-8576-1
- Cotter Pin (1 ea) PN MS 24665-628

(9) Install four Washer (PN MS 27183-18) on screws.

(10) Insert screws through existing spacer plate and through existing safety chain bracket.

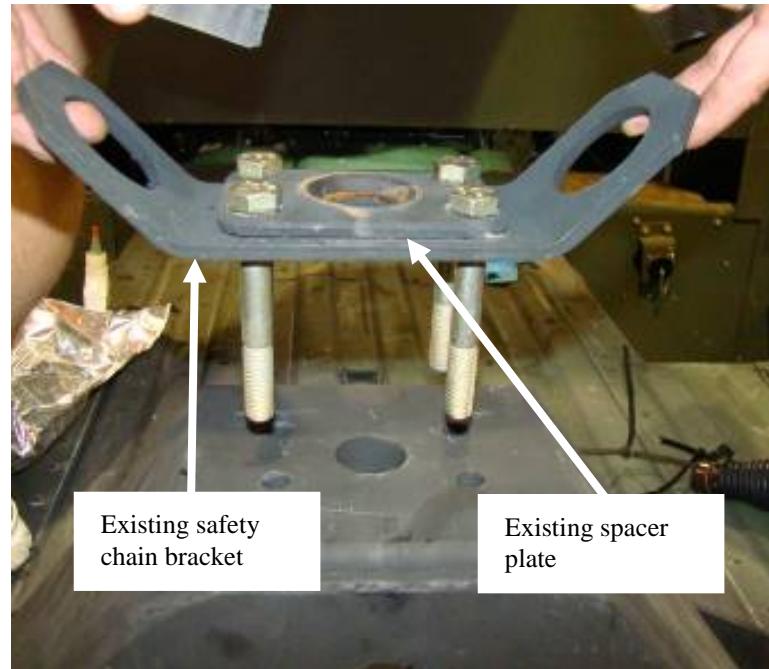


Figure D-13. Pintle Bracket Assembly Attached to Pintle Extension

(11) Attach pintle bracket assembly onto pintle extension (refer to Figure D-13).

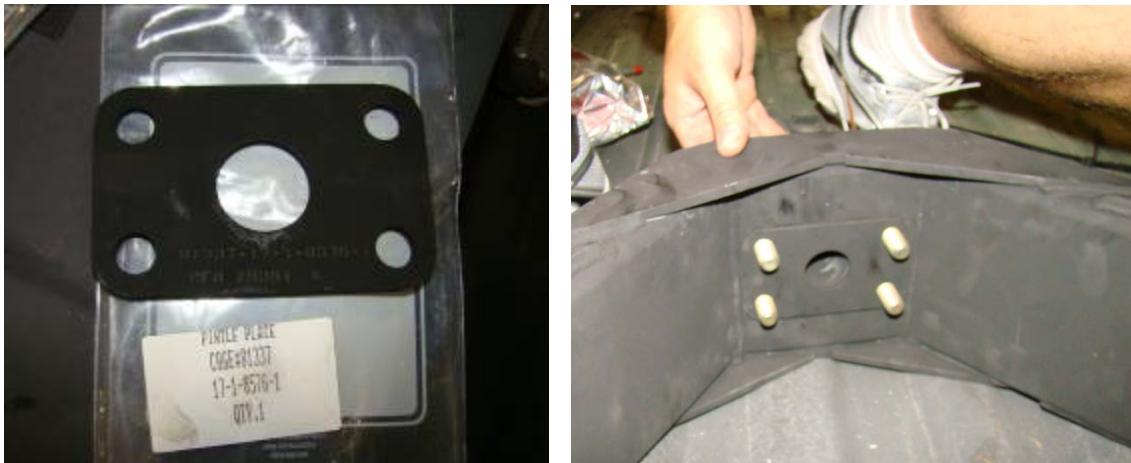


Figure D-14. Pintle Plate

(12) On backside of Pintle Extension (PN 17-1-8586-1), install new Pintle Plate (PN 17-1-8576-1) (refer to Figure D-14).

(13) Apply a thin coat of MIL-G-10924 grease to shank of towing pintle assembly.



Figure D-15. Pintle Inserted in Bracket

(14) Using three Washers (PN MS20002-20), original flat washer, original castellated nut, and new cotter pin, insert pintle through bracket and hand tighten only (refer to Figure D-15).

(15) Using four Lock Washers (PN MS35338-48) and four Nuts (PN MS51943-39), secure bracket to pintle extension.

(16) Using a 3/4 inch wrench and 3/4 inch socket with 1/2 inch drive ratchet, tighten four bracket screws.

(17) Using a 90 ft-lb torque wrench, torque the screws.



Figure D-16. Power Receptacle and Cover on New Receptacle Bracket

- (18) Using four Screws (PN MS51849-95) and four 1/4 inch-20 Nuts (PN 17-1-6871-2), attach power receptacle and cover to new Receptacle Bracket (PN 17-1-8577-1) (refer to Figure D-16).
- (19) Using a 7/16 inch wrench and 7/16 inch socket with 1/4 inch drive ratchet, tighten hardware.
- (20) Using two original mount screws, mount bracket to existing inboard receptacle mount holes. Do not install hex nut at this time.
- (21) Using two new Washers (PN MS27183-10) and Nuts (PN 501-250800-00), install Clamp Bracket (PN 17-1-8578-1) on backside of two mount screws, and then secure both brackets.

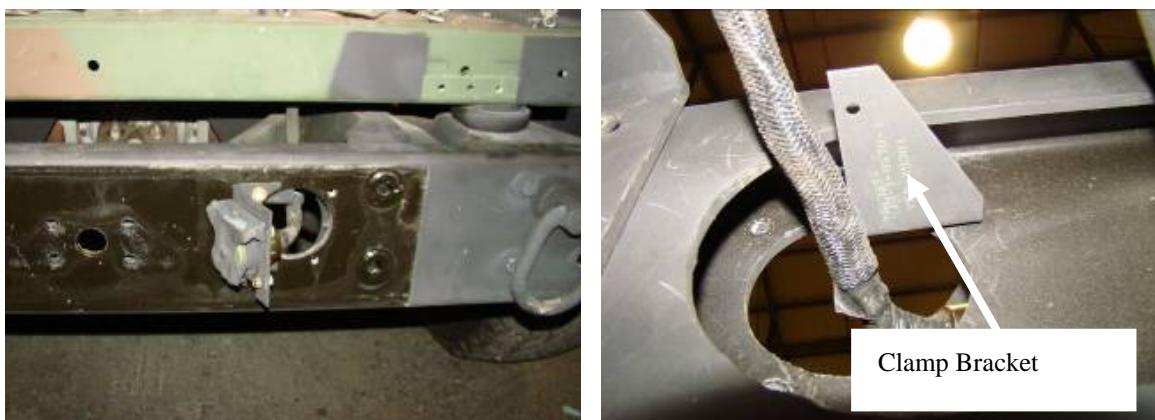


Figure D-17. Receptacle Cable Secured to Clamp Bracket

- (22) Using one Clamp (PN MS21333-73), one Screw (PN MS35206-245), and one Nut (PN 17-1-6871-1), secure receptacle cable to clamp bracket (refer to Figure D-17).
- (23) Using #2 cross-tip screwdriver and 3/8 inch socket with 1/4 inch drive ratchet, tighten hardware.
- (24) Align pintle extension with holes where reinforcement plate was installed.



Figure D-18. Pintle Extension Secured to Bumper

(25) Using four Screws (PN B1821BH050C575N), four Washers (PN MS 27183-18), four Washers (PN MS35338-48), two Clamp Brackets (PN 17-18579-1), and four Nuts (PN MS51943-39), secure pintle extension to bumper (refer to Figure D-18).

(26) Install clamp brackets on front side of pintle extension mount holes.

(27) Using a 3/4 inch wrench and 3/4 inch socket with 1/2 inch drive ratchet, tighten hardware, and then use a torque wrench to torque screws to 90 ft-lbs.

(28) Install four Screws (PN B1821BH050C175N), original flat washers, and four Nuts (PN MS51943-39) in original pintle mounting location.

(29) Using a 3/4 inch wrench and 3/4 inch socket with 1/2 inch drive ratchet, tighten hardware and, using a torque wrench, torque screws to 90 ft-lbs.

D-7. MOUNTING MTS TO VEHICLE.

a. Mounting Taillight to Clamping Bracket

(1) Obtain parts required to mount taillight assembly to clamping bracket and mount bracket (refer to Figure D-19).



Figure D-19. Taillight and Rear Mounting Hardware

- (2) Orient taillight assembly so that wires are down (refer to Figure D-19).
- (3) Using a 9/16 inch socket and 3/8 inch drive ratchet, remove two Screw, Hex Head (PN MS 35307-363) from taillight assembly.



Figure D-20. Taillight, Grounding Plate, and Clamping Bracket

- (4) Using two hex cap screws, attach Bracket, Clamping (PN 17-1-8245-1) to the back of taillight assembly on top of ground plate (refer to Figure D-20).

**Figure D-21. Wire Routing through Rear Mounting Bracket**

(5) Feed taillight assembly wires through hole in mounting bracket while feeding ground wire of Taillight Extension Installation (PN 7040189-501) through hole in opposite direction (refer to Figure D-21).

(6) Remove hex cap screw from clamping bracket and insert through the eyelet of ground wire attaching it to the taillight assembly through the clamping bracket.

(7) Using a 9/16 inch socket with 3/8 inch drive ratchet secure the assembly.

**Figure D-22. Taillight Mounted to Mounting Bracket**

(8) Using two Screw, Hex Head (PN MS35307-363), four Washer, Flat (PN MS15795-814), two Washer, Lock (PN MS 35338-141), and two Nuts (PN 13218E0320-293), mount taillight assembly to mounting bracket (refer to Figure D-22).

(9) Using a 9/16 inch wrench and 9/16 inch socket with 6-inch extension and 3/8 inch drive ratchet, tighten taillight assembly.



Figure D-23. Grommet Installed in Rear Mounting Bracket

(10) Make a single cut in Grommet (PN 17-1-6854-1) and wrap around taillight assembly wires and ground wire (refer to Figure D-23).

(11) Insert grommet into mounting bracket hole that wires are routed through (refer to Figure D-23).

b. Mounting Left and Right Rear Mounting Brackets to Bumper.

NOTE

Install hex cap screws from rear to front. Do not tighten at this time

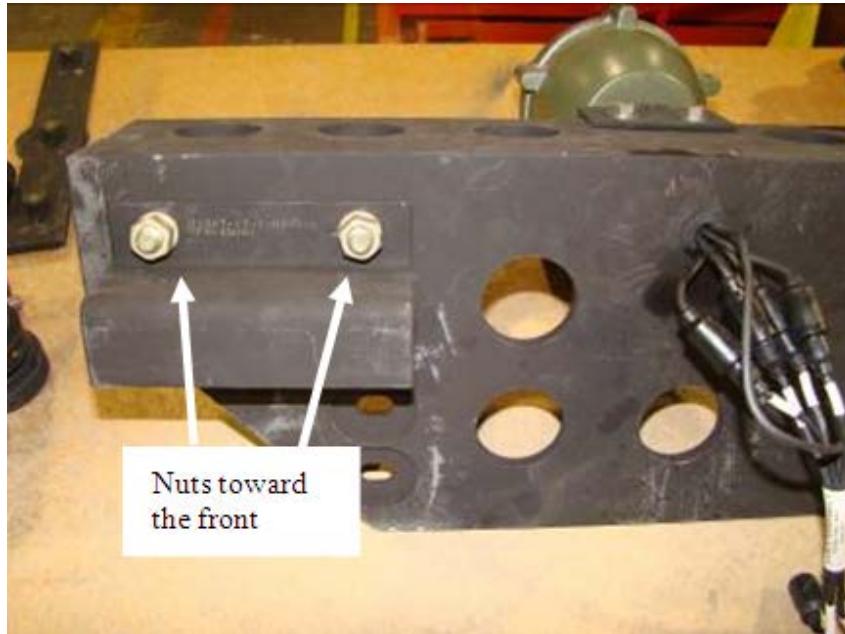


Figure D-24. Clamp Bracket Installed on Mounting Bracket

(1) Using two Screw, Hex Head (PN B1821BH050C150N), two Washer, Flat (PN NAS1149C0863R), two Washer, Lock (PN MS35338-48), and Nuts (PN MS51967-14), install Bracket, Clamping (PN 17-1-8245-1) to mounting bracket (refer to Figure D-24).

(2) Position left and right rear mount brackets toward the outside edge of rear bumper.



Figure D-25. Attaching Left and Right Rear Mount Brackets to Bumper

(3) Secure left and right rear mount brackets to vehicle bumper by inserting eight Screw, Hex Head (PN B1821BH050C375N) through mount brackets into the bumper assembly (refer to Figure D-25). Reuse existing eight washers and nuts previously removed.

(4) On left and right sides of reverse side of bumper, install eight previously removed flat washers and eight plain nuts. Tighten hardware using 3/4 inch wrench and 3/4 inch socket with 1/2 inch drive.



Figure D-26. Securing Rear Bracket to Bumper

(5) Using a 3/4 inch socket, 3/8 inch drive ratchet, and a 3/4 inch wrench, secure clamp bracket to bumper (refer to Figure D-26).

NOTE

- Electrically safe lubricant spray or silicone grease may be used to ease connection of taillight wires to pigtail extension.
- Ground wires are extremely long. After connection, ensure ground wires do not hang from vehicle. (Secure to existing harness using tie straps).



Figure D-27. Connection of Taillight and Vehicle Ground Wires

Table D-7. Taillight Wire Numbers

Left Rear		Right Rear	
Wire #	Harness #	Wire #	Harness #
21C	J-1	21E	J-1
224/61B	J-2	224/60C	J-2
23B	J-3	23D	J-3
24B	J-4	24C	J-4
95B	J-5	95F	J-5

(6) Connect taillight wiring to taillight extension pigtail (refer to Figure D-27 and Table D-7).

(7) Using a #3 cross-tip screwdriver and 9/16 inch wrench, connect taillight ground wires (labeled J5 GRD) from taillight extension pigtail to vehicle ground wires (labeled 95B/95F) (refer to Figure D-27).

**Figure D-28. Reinstallation of Inboard Cable Clamp to Cable Guard**

(8) Using 5/16 wrench and 5/16 socket with 1/4 inch drive ratchet reinstall inboard cable clamp to cable guard to secure wiring. Use tie straps to secure remaining slack to vehicle harness (refer to Figure D-28).

c. Installing Mounting Components to rear of MTS.

WARNING

ENSURE THAT MTS IS PROPERLY POSITIONED ON A SUPPORT STRUCTURE CAPABLE OF SUPPORTING 2200 LBS. ENSURE THAT LOAD TEST INSPECTION DATE ON STAND IS CURRENT. FAILURE TO OBSERVE SAFETY PROCEDURES WHEN WORKING UNDER THE MTS COULD RESULT IN INJURY OR DEATH.



Figure D-29. MTS Prepared for Installation on Vehicle

- (1) Refer to Figure D-29 to view MTS preparation for installation on vehicle.



Figure D-30. Left and Right rear Mounting Brackets

- (2) Obtain Bracket, Rear Mounting (PN 7047997-501 and PN 7047997-502) required to mount rear end of MTS to bumper (refer to Figure D-30).



Figure D-31. Installation of Rear Mounting Screws into Rear Mounting Bracket

(3) Insert one Screw, Hex Head (PN B1821BH050F475N) and one Washer, Flat (PN NAS1149C0863R) through each round opening of the left and right rear mounting brackets (refer to Figure D-31).

(4) Insert one Washer, Isolator Mount (PN 17-1-3606-1) into middle of rear mounting bracket with each previously installed hex cap screw going through it (refer to Figure D-31).



Figure D-32. Rear MTS Thread Protectors

(5) Remove thread protectors on left and right sides of MTS (refer to Figure D-32).

NOTE

Remove all paint and sealer from any rivet head that may come into contact with rear mounting bracket. Remove any hardware from bottom rear surface of the MTS.



Figure D-33. Upper Side Mounting Bracket Hardware Location



Figure D-34. Lower Side Mounting Bracket Hardware Location

(6) Using three Screw, Hex Head (PN MS35307-307), three Washer, Lock (PN MS35338-139), and three Washer, Flat (PN MS15795-810), mount left and right rear mounting brackets to MTS (refer to Figure D-33 and Figure D-34).

NOTE

Lubricate each hex cap screw prior to inserting into shelter.

(7) Using a 7/16 inch socket and 3/8 inch drive ratchet, secure mounting brackets to MTS. Leave loose enough for adjustments during install.

(8) Install three Screw, Hex Head (PN MS35307-360), three Washer, Flat (PN MS 15795-810), and three Washer, Lock (PN MS35338-139) along bottom edge of mounting bracket (refer to Figure D-34).

(9) Using a 9/16 inch socket and 3/8 inch drive ratchet, secure hardware to mounting bracket. Leave loose enough to make adjustments during install.



Figure D-35. Rear Mounting Bracket Underside Installation Location

(10) Install 14 Screw, Hex Head (PN MS35307-360), 14 Washer, Lock (PN MS35338-141), and 14 Washer, Flat (PN MS 15795-814) into underside of rear mounting bracket (refer to Figure D-35). Leave loose enough to make adjustments during install.



Figure D-36. Isolation Mount Washer Placement

(11) Insert one Washer, Isolator Mount (PN 17-1-3605-2) into the holes of the rear mount brackets (refer to Figure D-36).



Figure D-37. Rear Installation Mounting Isolator Placement

(12) Position one Isolator, Mounting Installation (PN 17-1-3607-1) on top of each isolation mount washer (refer to Figure D-37).

d. Installing Front Mounting Components



Figure D-38. Front Angle Assemblies and Placement Location

- (1) Obtain left Angle Assembly (PN 704135-501) and right Angle Assembly (PN 704135-502). Refer to Figure D-38.
- (2) Clear area around vehicle mount beam in roadside compartment.



Figure D-39. Removal of Turn-lock Fasteners

- (3) Using a drill with 1/4 inch drill bit, remove two turn-lock fasteners on left and right side of vehicle beam assembly (refer to Figure D-39).
- (4) Tap remainder out with ball peen hammer and center punch.
- (5) Remove thread protectors from front of MTS and eight plugs from underneath.

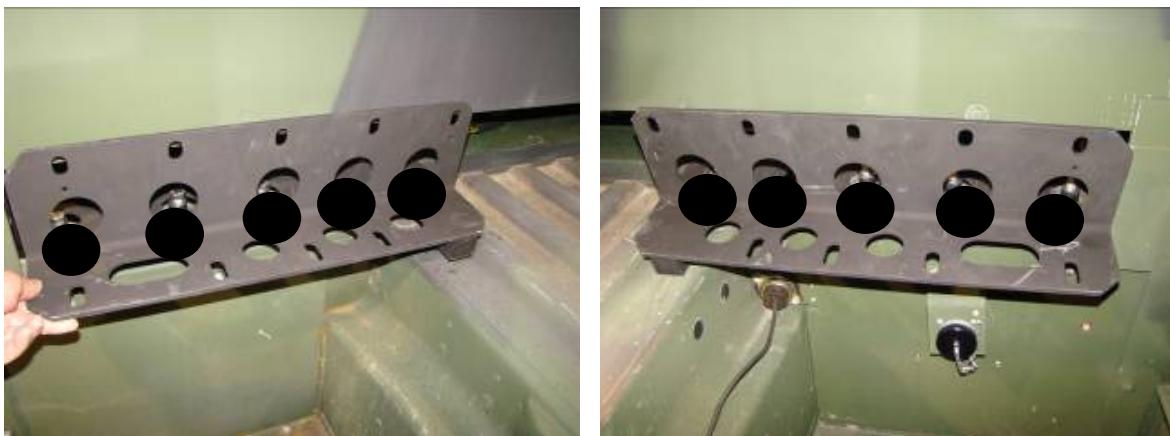


Figure D-40. Positioning Front Angle Assemblies

- (6) Position left and right angle assemblies on the vehicle beam with no hardware attached (refer to Figure D-40).



TO PREVENT INJURY OR DEATH TO PERSONNEL, ENSURE HOOKS OF THE LIFTING DEVICE ARE INSPECTED AND SECURELY ATTACHED BEFORE LIFTING MTS. SLINGS AND HOISTS MUST BE PROPERLY CERTIFIED. USE OF AN UNCERTIFIED SLING OR A SLING THAT IS NOT CURRENTLY CERTIFIED MAY RESULT IN EQUIPMENT DAMAGE OR SEVERE INJURY OR DEATH TO PERSONNEL.

- (7) Raise MTS off applicable platform using approved lifting device.

(8) Using lifting device, adjust height of MTS to enable positioning of vehicle.



Figure D-41. Positioning Rear Mount Screws over Bracket Holes

(9) Position vehicle so that rear MTS mount screws are located over their respective rear mount bracket holes and mounting hardware (refer to Figure D-41).

NOTE

Do not allow rear of MTS to fully rest on rear mount brackets.

(10) Lower MTS and guide rear mount screws into isolator and isolator washers and their respective rear mount bracket holes.



Figure D-42. Inserting Front Angle Assemblies between MTS and Armor Plate

(11) Continue lowering MTS and make adjustments to allow front mount bracket to be inserted between armor plate, bed of vehicle, and vehicle beam (refer to Figure D-42).

(12) Allow MTS to fully rest on rear mount brackets with mount screws going through mounting isolator, washer and rear mounting bracket.



Figure D-43. Installation of Spacer Sleeve

(13) Insert Spacer (PN NAS43HT8-156) onto each mount screw and push up inside of isolator (refer to Figure D-43).



Figure D-44. Installation of Upper Isolator Washer

(14) Position upper isolator washer onto mount screw and slide up onto isolator (refer to Figure D-44).

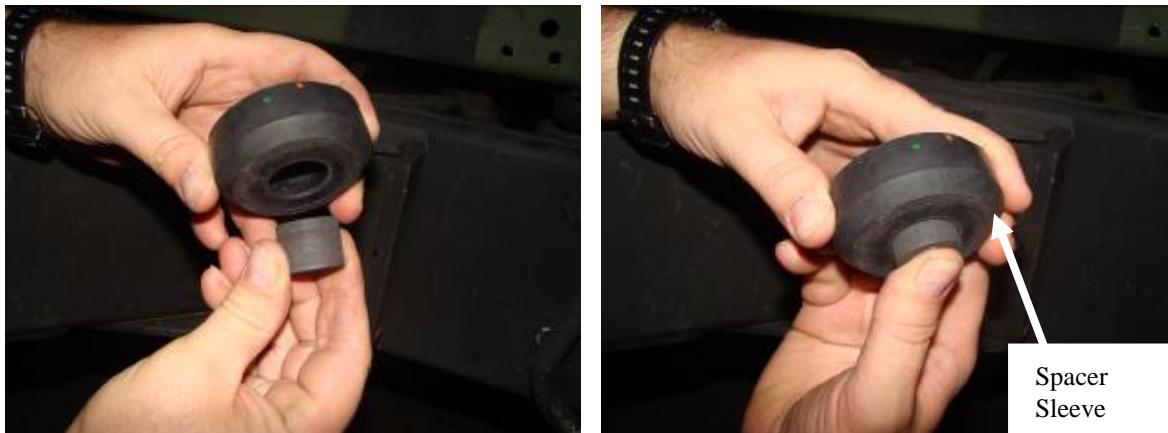


Figure D-45. Inserting Spacer into Lower Isolation Washer

(15) Insert Spacer (PN 17-1-8243-1) into lower isolator washer (refer to Figure D-45).



Figure D-46. Installation of Lower Isolation Washer with Spacer

(16) Install second isolation washer with spacer onto mount screw (refer to Figure D-46).



Figure D-47. Installation of Isolation Flat Washer

- (17) Install Washer, Isolator Mount (PN 17-1-3606-1) onto mount screw (refer to Figure D-47).
- (18) Install Washer, Flat (PN NAS1149C0863R) and Nut, Hex, Self-Locking (PN 17-2-0488-1) onto mount screw.
- (19) Secure using a 3/4 inch socket with 3/8 drive ratchet and 3/4 inch wrench.

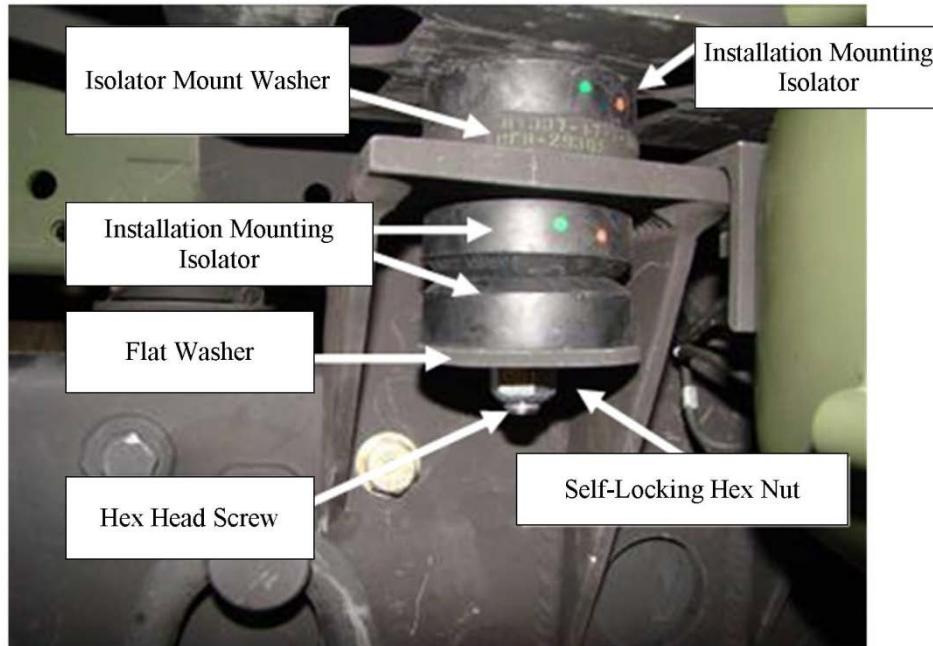


Figure D-48. Rear Mounting Parts Breakdown

- (20) Inspect parts to ensure proper order of assembly upon completion (refer to Figure D-48).
- (21) Adjust height of MTS to line up holes of mount bracket to holes of MTS.



Figure D-49. Front Angle Assemblies Installation

(22) Using 10 Screw, Hex Head (PN 35307-413) coated with lock tight, 10 Washer, Flat (PN 1149C0863R), and 10 Washer, Lock (PN 35338-143), attach left and right angle assemblies to the front of MTS (refer to Figure D-49).

(23) Secure using a 3/4 inch deep well socket and 1/2 inch drive ratchet. Leave loose enough to make adjustments during install.



Figure D-50. Front Angle Assemblies Underside Hardware

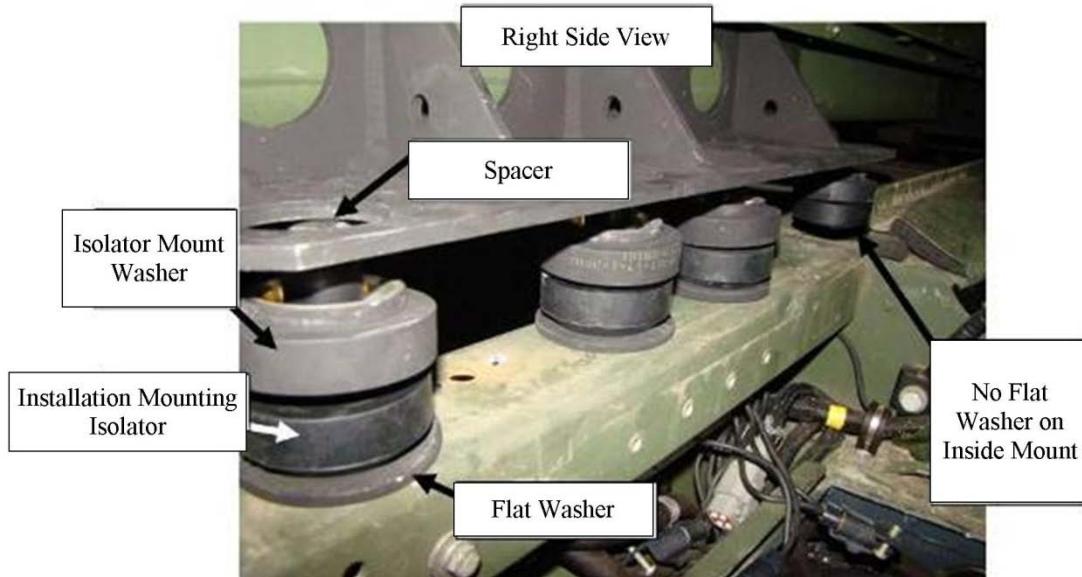
(24) Insert eight 1/2 x 20 Bolt-Machine, Aircraft (PN AN8C7A) and 1/2 inch flat washers into bottom underside of front mount bracket (refer to Figure D-50).

**Figure D-51. MTS Mounting Bolts**

(25) Tighten hardware using a 3/4 inch socket with 3/8 inch drive ratchet (refer to Figure D-51).

NOTE

- No flat washer goes under the inside isolator.
- To assist in installation, the mounting screws can be inserted through the spacer sleeve, isolator washer, isolator, and flat washer to keep the mounting hardware aligned while lowering the bracket.

**Figure D-52. Front Angle Assemblies Hardware**

(26) Position three flat washers, four isolators, four spacer sleeves, and four isolation washers onto left side and right side of forward vehicle beam (refer to Figure D-52).



Figure D-53. Front Angle Assemblies Resting on Hardware

(27) Adjust position and height of MTS allowing the angle assemblies to rest on the hardware installed in step (16), ensuring that the edge of the isolation washers go through the round holes of the angle assemblies (refer to Figure D-52).

(28) With left and right angle assemblies resting on mounting hardware, lower MTS to a point where there is no tension left on the lifting device (refer to Figure D-53). MTS should now be resting on vehicle.

NOTE

Do not disconnect lifting device at this time. Adjustments may need to be made to ensure that all hardware is properly mounted.

(29) Ensure that bracket is fully resting on mounting hardware and that isolator washer edges are aligned in bracket holes.

(30) If installed, remove mounting screws from mounting hardware.

(31) Install isolation mount washer through bracket hole onto male isolator.

(32) Install flat washer on top of isolation mount washer.

(33) Insert hex screw through upper and lower mounting hardware, bracket, and vehicle beam.



Figure D-54. Mounting Kit Bar Installation

- (34) Back out left bolt on roadside in transmission control module compartment.
- (35) Position mounting kit bar under vehicle beam with holes matching the three outermost hex screws (refer to Figure D-54).

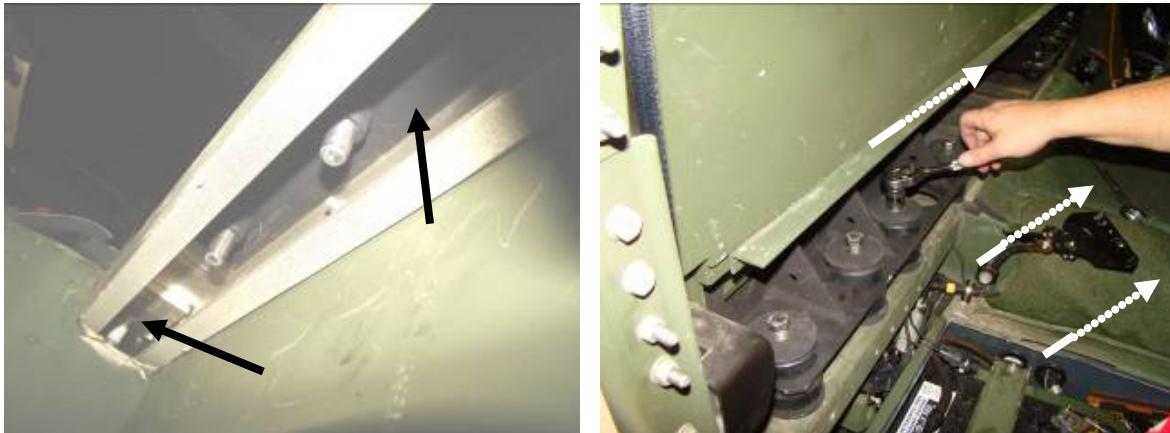


Figure D-55. Tightening Front Angle Assemblies Hardware

- (36) Thread mounting hex screws into the mounting kit bar and tighten with a 3/4 inch socket and 3/8 inch ratchet (refer to Figure D-55).
- (37) Use a 3/4 inch wrench, 3/4 inch socket, and 1/2 inch drive ratchet to secure innermost hex screw with Nut, Hex, Self-Locking (PN 17-2-0488-1) and 1/2 inch flat washer.
- (38) Tighten the left bolt on roadside in transmission control module compartment that was loosened in step (32).

- (39) Make final adjustments to all mounting hardware and ensure that MTS is properly positioned.
- (40) Tighten front and rear isolator mounting screws, 8 to 10 ft-lbs, using a certified torque wrench.
- (41) Using a certified torque wrench, tighten machine screws on front and bottom side of front mounting bracket 8 to 10 ft-lbs.
- (42) Install armor plating behind roadside and curbside seats attaching four 1/4-20 bolts, four 1/4 inch flat washers, and four 1/4 inch lock washers.

(43) Secure using a 7/16 inch socket and 1/4 inch drive ratchet



Figure D-56. Installation of Curbside Seat

(44) Install roadside and curbside seats in vehicle cab by inserting rear of each seat into groove behind battery and securing seat with latches on front of seat mount (refer to Figure D-56).

(45) Connect all VIP cables (refer to paragraph 3-5 a.)

(46) Using a 5/8 inch wrench, connect grounding straps to MTS and HMMWV.



Figure D-57. Connect Grounding straps to MTS and Vehicle

(47) Connect W226 cable into vehicle power outlet and J2 of MTS.

APPENDIX E

MOBILE TACTICAL SHELTER REMOVAL FROM VEHICLE

E-1. INTRODUCTION.

The primary reference for performing this action is TM 10-5411-235-13&P Addendum. The secondary references for performing this action are TB 9-2320-335-13&P, TM 11033-OR, TM 9-2320-387-24, and TM 11033-INP. This Appendix provides supplemental information not found in the primary and secondary references.

E-2. PREPARATION REQUIREMENTS.

Removing the Mobile Tactical Shelter (MTS) from a M1123 vehicle requires tools and parts listed in Tables D-1 through D-4. Before removing the MTS, assemble the following tools and be prepared to bag and tag kit materials:

Table E-1. Tool List, MTS Removal

Tool	Description
Allen Socket Wrench	5/16"
Standard Socket 1/4 "	5/16", 3/8"
Standard Socket 3/8 "	3/8", 7/16", 1/2", 9/16", 5/8", 3/4"
Standard Socket 1/2"	7/16", 1/2", 9/16", 5/8", 3/4", 3/4" Deep well
Ratchet	1/4" Drive, 3/8" Drive, 1/2" Drive
Extension 3/8" drive	6", 12"
Breaker Bar	1/2 "
Adapter	1/2" to 3/8"
Extension 1/2" drive	2.5", 5"
Wrench Combination	5/16", 3/8", 7/16", 9/16", 5/8", 3/4"
Drill	Power, Adjustable Chuck
Drill Bit	1/4"
Torque Wrench	10 ft-lbs, 90 ft-lbs
Screwdriver	#2 Cross-tip

Table E-2. Major Parts List, MTS Removal

Item No	NSN	CAGE	Part Number	Description	Qty
1	5411-01-581-2654	01365	0820G0000	SHELTER EXPANDABLE, (Mobile Tactical Shelter) AN/TSQ-272	1
2	2320-01-540-2007	19207	87T0146	TRUCK, UTILITY, Expanded Capacity Enhanced, IAP/Armor Ready M1152A1 W/B2 Armor Kit	1
3	5411-01-499-5433	81337	17-1-8565-1	EXTENSION KIT, Pintle	1
4		29381	7047143	MOUNTING KIT, Shelter	1

Table E-3. Pintle Extension Kit Parts List

Item	NSN	Nomenclature or Description	Part Number	Quantity
1	5310-00-809-5998	WASHER	MS27183-18	4
2	5310-00-809-4058	WASHER	MS27183-10	2
3	5310-00-696-5173	NUT	17-1-6871-2	6
4	5310-01-016-0720	NUT	17-1-6871-1	1
5	5305-00-984-6193	SCREW	MS35206-245	1
6	5305-01-502-2638	SCREW	B1821BH050C575N	4
7	5305-00-071-2078	SCREW	B1821BH050C375N	4
8	5305-00-071-2067	SCREW	B1821BH050C125N	4
9	5310-00-488-3889	NUT	MS51943-39	12
10	5305-01-016-4344	SCREW	MS51849-95	4
11	5310-00-584-5272	LOCKWASHER	MS35338-48	8
12	5315-00-846-0126	COTTER PIN	MS24665-628	1
13	5340-00-057-2906	CLAMP	MS21333-73	1
14	5310-00-515-8776	WASHER	MS20002-20	3
15	5340-01-536-9852	CLAMP BRACKET	17-1-8579-1	2
16	5340-01-500-1208	CLAMP BRACKET	17-1-8578-1	1
17	5340-01-500-1251	RECEPTACLE BRACKET	17-1-8577-1	1
18	5340-01-500-1205	PINTLE PLATE	17-1-8576-1	1
19	2540-01-500-3206	PINTLE EXTENSION	17-1-8568-1	1

Table E-4. Shelter Mounting Kit Parts List

Item	NSN	Nomenclature or Description	Part Number	Quantity
1		BRACKET, Rear Mounting	7047997-501	1
2		BRACKET, Rear Mounting	7047997-502	1
3		ADAPTER, Mounting	7048008-501	1
4		ADAPTER, Mounting	7048008-502	1
5	5342-01-494-1414	ISOLATOR, Mounting Installation	17-1-3607-1	20*
6	5310-01-493-7690	WASHER, Isolator Mount	17-1-3605-2	6
7		WASHER, Isolator Mount	17-4-3606-1	28
8	5310-00-167-0806	WASHER, Flat	NAS1149C0863R	38
9	5310-01-582-3170	NUT, Hex, Self-Locking	17-2-0488-1	8
10	5365-01-423-4059	SPACER	NAS43HT8-156	14
11	5305-00-410-6957	SCREW, Hex Head	B1821BH050F475N	14
12	5340-01-527-9794	MOUNTING KIT BAR ASSEMBLY	17-1-3597-1	2
13	5305-00-021-3620	SCREW, Hex Head	MS35307-307	6
14	5310-00-582-5677	WASHER, Flat	MS15795-810	6
15	5310-00-933-8121	WASHER, Lock	MS35338-139	6
16	5305-00-576-5417	SCREW, Hex Head	MS35307-360	34
17	5310-00-984-7042	WASHER, Lock	MS35338-141	42
18	5310-01-389-7976	WASHER, Flat	MS15795-814	42
19	5305-00-208-1429	SCREW, Hex Head	MS35307-363	4
20	5305-00-721-5665	SCREW, Hex Head	MS35307-361	4
21	5305-00-071-2069	SCREW, Hex Head	B1821BH050C150N	4
22	5310-00-584-5272	WASHER, Lock	MS35338-48	4
23	5310-00-004-3099	NUT	MS51967-14	4
24	5340-01-527-8908	BRACKET, Clamping	17-1-8245-1	2
25		Deleted		

Table E-4. Shelter Mounting Kit Parts List (Continued)

Item	NSN	Nomenclature or Description	Part Number	Quantity
26	5365-01-527-9273	SPACER	17-1-8243-1	6
27	5310-00-913-8881	NUT	MS51971-3	4
28	5340-01-494-0521	BRACKET, Tail Light	17-1-8246-1	2
29	5325-01-493-7956	GROMMET	17-1-6854-1	2
30	5305-00-071-2078	SCREW, Hex Head	B1821BH050C375N	8
31		ANGLE ASSEMBLY	7047135-501	1
32		ANGLE ASSEMBLY	7047135-502	1
33	5310-01-493-7694	WASHER, Isolator Mount	17-1-3605-1	
34	5310-01-555-0024	WASHER, Lock	MS35338-143	10
35		ADHESIVE, (LOCTITE), Not Provided	AN0321	
36	5306-00-579-5702	BOLT-Machine, Aircraft	AN8C7A	8
37	5305-00-021-3806	SCREW, Hex Head	MS35307-413	10
38		Deleted		
39		Deleted		
40		TAILLIGHT EXTENSION INSTALLATION	7040189-501	2

NOTE

The following table of supplemental material is provided as additive information to Table E-3 and Table E-4. Removal step descriptions use supplemental material descriptions where original technical information was found deficient

Table E-5. Mounting and Pintle Kit Supplemental Material List

Item	Kit	NSN	Nomenclature or Description	Part Number	Quantity
1	MOUNTING	5305-00-071-2067	SCREW, Cap, Hex Head .5 x 1.25 GR 8	B1821BH050C125N	10
2	MOUNTING	5305-00-719-5273	SCREW, Cap, Hex Head .5 x 4.25 GR 8	B1821BH050F425N	2
3	PINTLE	5305-00-071-2070	SCREW, Cap, Hex Head .5 x 1.75 GR 8	B1821BH050C175N	4

CAUTION

Pneumatic tools shall not be used during installation or removal process. Severe damage to equipment could result.

NOTE

- The instruction in this Appendix describes the removal of the MTS to an M1152 HMMWV.
- Prior to performing removal procedures, inventory removed kit parts per this Appendix.

E-3. REMOVAL OF MTS FROM VEHICLE.

a. Preparation for Removal of MTS

WARNING

- ENSURE THAT MTS IS PROPERLY POSITIONED TO A LIFTING APPARATUS CAPABLE OF SUPPORTING 2200 LBS. ENSURE THAT LOAD TEST INSPECTION DATE ON STAND IS CURRENT. FAILURE TO OBSERVE SAFETY PROCEDURES COULD RESULT IN INJURY OR DEATH.
- TO PREVENT INJURY OR DEATH TO PERSONNEL, ENSURE HOOKS OF LIFTING DEVICE ARE INSPECTED AND SECURELY ATTACHED BEFORE LIFTING MTS. SLINGS AND HOISTS MUST BE PROPERLY CERTIFIED. USE OF AN UNCERTIFIED SLING, OR A SLING THAT IS NOT CURRENTLY CERTIFIED, MAY RESULT IN EQUIPMENT DAMAGE OR SEVERE INJURY OR DEATH TO PERSONNEL.



Figure E-1. Positioning of Vehicle and Equipment

CAUTION

To prevent damage to equipment, lubricate all screws and bolts prior to installation and removal.

- (1) Move vehicle to assigned integration work area.
- (2) Ensure vehicle transmission is in neutral and parking brake is set.
- (3) Turn off vehicle.
- (4) Place wheel chocks in front of and behind vehicle wheel (refer to Figure E-1).
- (5) Attach certified lifting device to MTS assembly (refer to Figure E-1).
- (6) Ensure all cables are disconnected from the VIP.



Figure E-2. Ground Strap Removal

- (7) Ensure W226 cable is disconnected from the MTS and HMMWV.
- (8) Ensure grounding straps between vehicle and shelter are removed using a 5/8 inch wrench.



Figure E-3. Curbside Seat Removal

(9) Remove curbside seat from vehicle by unlatching two front seat latches (refer to Figure E-3).

(10) Lift and slide seats out of rear bracket groove and remove from vehicle.



Figure E-4. Removal of Armor Plating

(11) Using a 7/16 inch socket and 1/4 inch drive ratchet, remove armor plating behind roadside and curbside seats (refer to Figure E-4).

(12) Bag and retain all kit hardware for later reinstallation.

(13) Using a 3/4 inch socket and 3/8 inch drive ratchet, remove mounting screws, flat washer, large flat washer, and upper isolator on roadside and curbside front mounting brackets.

(14) Using a 3/4 inch wrench, 3/4 inch socket, and 1/2 inch drive ratchet, remove innermost hex screw with Nut, Hex, Self-Locking (PN 17-2-0488-1) and 1/2 inch flat washer.



Figure E-5. Removal of Front Mounting Bracket Upper Hardware

(15) Remove and retain machine screws from curbside and roadside front mounting brackets. Bracket cannot be removed. (refer to Figure E-5).



Figure E-6. Front Mount Bracket Underside Hardware



Figure E-7. Removal of Front Mounting Hardware from Vehicle Beam

- (16) Remove mounting kit bar from under vehicle beam (refer to Figure E-6).
- (17) Raise MTS sufficiently to remove remaining hardware on vehicle beam (refer to Figure E-7).



Figure E-8. Removal of Front Mounting Bracket Hardware

- (18) Using 3/4 inch deep well socket, 3/8 inch drive ratchet, and 12-inch extension, lower MTS sufficiently to gain access to upper machine screws to remove front mount brackets from front of MTS (refer to Figure E-8).
- (19) Remove 10 Screw, Hex Head (PN 35307-413), 10 Washer, Flat (PN 1149C0863R) and 10 Washer, Lock (PN 35338-143) to remove front mounting bracket and retain hardware.
- (20) Use a 3/4 inch socket, 3/8 inch drive ratchet, and 3/4 inch wrench to remove nut, flat washer, large flat washer, upper and lower isolators on bottom of roadside and curbside rear mounting adaptors.

NOTE

Ensure MTS has been lifted off vehicle beam and rear mounting brackets prior to moving vehicle from under MTS.

- (21) Raise MTS as evenly as possible lifting weight off vehicle front beam and rear mounting brackets.
- (22) Using a 7/16 inch socket and 1/4 inch drive ratchet, reinstall armor plating behind roadside and curbside seats.



Figure E-9. Curbside Reinstallation

- (23) Reinstall curbside seat by inserting rear of seat into groove and locking front section into place using locking latches (refer to Figure E-9).

- (24) Move vehicle from under MTS.



Figure E-10. Removal of Mounting Screws

(25) Using a 7/16 inch socket and 3/8 inch drive ratchet, remove rear-mounting bracket and three Screw, Hex Head (PN MS35307-307), three Washer, Lock (PN MS35338-139), and three Washer, Flat (PN MS15795-810) from vehicle. (refer to Figure E-10).

(26) Using a 9/16 inch socket and 3/8 inch drive ratchet, remove lower side mounting screws (refer to Figure E-10).

(27) Using 3/4 inch socket, 3/8 inch drive socket, and 12-inch extension, remove underside mount screws (refer to Figure E-10).

(28) Remove rear-mounting adaptor from MTS.

(29) Retain all pintle and mounting kit hardware. Mark piece part numbers per Tables E-3 and E-4, package, and store for future use.

WARNING

ENSURE THAT MTS IS PROPERLY POSITIONED ON A SUPPORT STRUCTURE CAPABLE OF SUPPORTING 2200 LBS. ENSURE THAT LOAD TEST INSPECTION DATE ON STAND IS CURRENT. FAILURE TO OBSERVE SAFETY PROCEDURES WHEN WORKING UNDER THE MTS COULD RESULT IN INJURY OR DEATH.

NOTE

If available, use the shelter pallet provided during initial system delivery.

(30) Lower MTS onto support structure capable of supporting the system weight of 2200 lbs.

APPENDIX F

MOBILE TACTICAL SHELTER VEHICLE OPERATING RESTRICTIONS

The following letter lists operational restrictions of the Mobile Tactical Shelter (MTS) necessary to ensure personnel safety and protect equipment from damage.



UNITED STATES MARINE CORPS
MARINE CORPS SYSTEM COMMAND
PROGRAM MANAGER, MOTOR TRANSPORTATION
2200 LESTER ST
QUANTICO, VA 22134-6050

IN REPLY REFER TO:
 5000
 PMM 151
 05 Oct 11

From: Program Manager, Motor Transportation
To: Program Manager, MAGTF C2 Systems

Subj: VEHICLE OPERATING RESTRICTIONS FOR ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM MOBILE TACTICAL SHELTER

Ref: (a) VOR the AFATDS MTS of 28 Feb 11
 (b) ATEC Project No. 2010-DT-ATC-MCSPT-F0700 Final Report No. ATC-10641 of Jul 11

1. General. This vehicle operating restrictions letter supersedes reference (a) and is issued to certify that Program Manager, Motor Transportation (PM MT) has evaluated the automotive characteristics of the Advanced Field Artillery Tactical Data System Mobile Tactical Shelter (AFATDS) MTS integrated with M1152A1B2FK5 High Mobility Multipurpose Wheeled Vehicle (HMMWV). PM MT has reviewed test data in reference (b), and vehicle operating restrictions herein have been established.

2. Operating Restrictions. The following vehicle operating restrictions shall be observed in order to ensure personnel safety, survivability, and maintain equipment performance for the integrated AFATDS MTS system. These restrictions apply to the integrated AFATDS MTS on an armored M1152A1 with B2 kit and FRAG 5 only, when operated with or without a trailer.

a. The integrated AFATDS MTS speed should not exceed 40 miles per hour (mph) over primary road surfaces, 35 mph over secondary surfaces and 20 mph over any off-road cross country surfaces, the standard armored Expanded Capacity Vehicle (ECV) speeds on terrain are 45/35/20 mph. Speed restrictions are imposed due to results from steering and handling evaluations.

b. The integrated AFATDS MTS should not be parked on grades greater than 30%. Longitudinal grade restrictions are imposed due to results from the longitudinal grade evaluation.

Subj: VEHICLE OPERATING RESTRICTIONS FOR ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM MOBILE TACTICAL SHELTER

c. The integrated AFATDS MTS should not operate on side slopes greater than 30%, the standard armored HMMWV ECV side slope specification.

d. Vehicle operators shall be advised that braking distances are increased on all terrain types due to overweight front axle and GVW conditions. Operators should maintain greater following distances and begin to stop vehicle earlier than normal to maintain safety.

e. Users should increase all inspections and preventative maintenance checks of the AFATDS MTS due to overweight front axle. This overloaded condition will increase the frequency of component failures such as springs and shocks and result in decreased life of the brake system components. Frequency of checks will be based on the AFATDS MTS's operating environment and the amount of system usage.

3. System Testing Results. Per reference (b), AFATDS MTS is comprised of an S-788 light mobile shelter (LMS) attached to its carrier, an armored M1152AB2FK5, in combination with an M116A3 trailer. Test results are listed below:

HMMWV Gross Vehicular Weight (GVW)	HMMWV Front Axle Weight w/o trailer	HMMWV Rear Axle Weight w/o trailer	Gross Trailer Weight (GTW)
13,440 lbs	6,500 lbs	6,940 lbs	1,980 lbs

The integrated AFATDS MTS system exceeds HMMWV Gross Vehicle Weight Rating (GVWR) by 1,340 lbs and front Gross Axle Weight Rating (GAWR) by 1,200 lbs.

The integrated AFATDS MTS system vertical center of gravity (CG) measurements are reported as follows:

Vertical CG of HMMWV	Vertical CG of standalone trailer
39.3 inches	30.0 inches

The integrated AFATDS MTS system does not exceed M1152A1B2FK5 HMMWV or M116A3 trailer CG specifications.

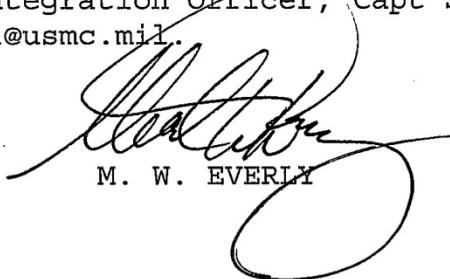
4. Documentation of Restrictions. It is the responsibility of the AFATDS MTS Project Officer to ensure restrictions stated in this letter are published in all applicable system manuals and incorporated into all applicable training plans and supporting

Subj: VEHICLE OPERATING RESTRICTIONS FOR ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM MOBILE TACTICAL SHELTER

material. PM MT can assist with the phrasing of restrictions in applicable documentation, and PM MT should review any vehicle restriction related documentation prior to it being published.

5. Configuration Limited Applicability. This memorandum is valid only for fielding of systems in the "as tested" configuration specified in reference (b). Any system modifications that change the total weight, weight distribution, or CG location will void this letter and will require retesting of the system.

6. Point of Contact. Questions regarding this memorandum should be directed to the PM MT Integration Officer, Capt Shawn Miller, at 703-432-3558, shawn.miller1@usmc.mil.



M. W. EVERLY

Copy to:
Safety (GTES)

